



# **UK Green Investment Bank – Examining the Case for Continued Intervention**

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Green Investment Bank plc

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## Executive Summary

In launching the UK Green Investment Bank plc (GIB) in 2012, the Department for Business Innovation & Skills (BIS) committed to review its impact after an initial few years of operation. NERA Economic Consulting has been commissioned to undertake this review and to consider GIB's future role over the period to 2020 and into the next decade. The NERA project team was supported by Clean Infra Partners, which specialises in Climate Finance advisory.

### Key Findings

Based on evidence gathered from our research and extensive interviews with GIB staff, government representatives, investors, and other participants in the green infrastructure markets where GIB is active, our key findings are summarised below.

- GIB has helped to reduce various barriers to investment across the green economy, attracting private sector capital that otherwise may not have been invested – or that might have been invested with some delay, or at higher cost. The success of GIB's activities to date varies across sectors.
- GIB has successfully addressed temporary liquidity barriers in the offshore wind and waste and bioenergy sectors, where it has deployed substantial capital. GIB has been less able to identify suitable projects and invest as much capital in the non-domestic energy efficiency sector, and has only been active in the small-scale renewables sector for a relatively short period of time.
- GIB has helped other investors assess the risks of investment, drawing on deep specialist knowledge of its core sectors that other financial institutions lack. Partners trust GIB as an experienced, honest broker, and this trust is enhanced by GIB's commercial stake in the investments (providing “skin in the game”).
- GIB's investment strategy continues to evolve. Overall GIB sees its mission as demonstrating to other investors that it is possible to be green and profitable. GIB's initial investments were in less risky projects, through which it sought to establish a track record, but it has moved to deploy capital into projects with more risk. Some market participants suggested that GIB could take on even more risk, and could be more liberal in pushing the boundaries of the requirement that it invest on commercial terms.
- In terms of GIB's future role, barriers to investment in green infrastructure remain. GIB still has a role to play in offshore wind and waste and bioenergy, and should focus on earlier stages of the project lifecycle and on tackling technology risk. For GIB to have a significant impact on non-domestic energy efficiency many felt it should take on additional risk or provide concessionary finance of some kind.
- GIB could have a role in new sectors where it does not yet operate, but it is important that clear government targets and policies already be in place in these sectors, because GIB cannot substitute for these.
- There is also the potential for GIB to offer new products, some have suggested debt guarantees, concessionary loans, or investments in demonstration projects.
- Many of these suggestions, however, would contradict GIB's current business model and policy rationale, which centres on investing alongside private capital at market terms – a model that is also clearly valued by project developers and co-investors.

## Impact to date

GIB was set up in 2012 to help encourage private sector capital into the green economy and thereby act as a policy tool to assist in delivering the government's green agenda. To this end, GIB has been allocated £3.8 billion of government money to invest into the green economy, focusing on four key sectors. GIB has been established with an Edinburgh Head Office and a London transaction hub, growing from an initial 25 employees to over 100 by the first half of 2015. As of May 2015 GIB had committed a little over £2 billion, with around £1.6 billion allocated towards the financing of specific projects, and the remainder committed to funds or partners targeting specific sectors, but not yet allocated to specific projects.<sup>1</sup> £1.1 billion of GIB's project investment has been directed towards the offshore wind sector.

An important indicator that GIB tracks is its "mobilisation rate". This is the ratio of the volume of investment made by GIB's co-investors in its projects to the volume of GIB's own project investments. If the projects GIB invests in would not have gone ahead without its intervention (i.e. GIB's capital is additional to what the market would otherwise have provided), then a higher mobilisation rate means that GIB capital encourages a greater contribution to the green economy from private sector capital for each £1 that GIB invests. The average mobilisation rate for GIB's investments is 3.4,<sup>2</sup> although there is a considerable range across sectors and types of investment. The mobilisation rate for waste and bioenergy (W&B) is the highest by some margin, at 5.6, followed by offshore wind (OSW) at 2.6, small-scale renewables (SS RES) at 1.5 and lastly non-domestic energy efficiency (NDEE), which has a mobilisation rate of 1.0.<sup>3</sup>

We have drawn on a number of different sources for this research – including investors, project developers and owners, market advisors and government officials – both to help us evaluate GIB's impact to date and to offer views on GIB's future role in the green economy. In order to obtain input from a wide cross-section of stakeholders we designed and implemented a survey to assist in our assessment of GIB. We also carried out a number of follow-up interviews across each of GIB's main sectors of activity to investigate specific topics in more detail – both with those that had completed the survey and others who had not.

Our framework for both the historical and forward-looking analysis is based on an examination of barriers to investment, brought about by underlying market failures, which are present in the markets that GIB operates in and which GIB has sought to address. The relevance (and importance) of different barriers varies across sectors.

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<sup>1</sup> Throughout the report, we refer to GIB's "deployed" capital as the amount it has either provided or is contracted to provide to specific projects. We refer to "committed" capital as the sum of the deployed capital and capital that GIB has made available to fund managers or partners to deploy into the sector once suitable projects are identified (i.e. fund capitalisation). The difference between the value GIB has "committed" and the value it has "deployed" is explained by the amount with which GIB has capitalised funds, but which has not yet been allocated to individual projects.

<sup>2</sup> Thus, on average each £1 that GIB has invested has been matched by around £3.4 of private sector capital.

<sup>3</sup> These rates are calculated from GIB's *cumulative* investment in each sector and the accompanying private investment - without taking into account any subsequent divestments. Taking divestments into account would increase the mobilisation rate for OSW to 2.9, and the overall mobilisation rate to 3.7, owing to GIB and a co-investor partly refinancing an equity stake that they had previously jointly acquired in the Westernmost Rough offshore wind farm.

With the barriers to investment in mind, GIB has developed, and published, investment strategies for each of its sectors.<sup>4</sup> These strategies have developed over time, to adjust to changing market conditions and ensure that GIB focuses on crowding-in, rather than crowding-out, investment. To this end GIB has internal processes to review the additionality of all of its investments.

Drawing on the survey results and interviews with market participants we found a complex and mixed assessment of GIB's impact across sectors, and also within sectors, which can be summarised as follows:

- **OSW** – Tackling insufficient liquidity emerges as one of GIB's principal achievements in OSW over its first two and a half years. Several market participants that we spoke to highlighted GIB's role in providing a degree of reassurance to co-investors, both due to its experience and understanding of the sector as well as the fact that it was committing its own capital (from government), offering "skin in the game". The majority of those we spoke to believed that GIB had been instrumental in either providing liquidity to the market when it was needed or in preventing delays to the transactions it participated in, and that GIB's involvement helped to increase investor confidence in the sector and thereby reduce the returns that co-investors would otherwise have demanded had they invested in UK offshore wind projects *without* GIB. Our survey responses, and some follow-up interviews, suggested that a number of market participants believed that at least some of the transactions that GIB participated in could have gone ahead anyway without GIB, questioning its additionality in the sector. These responses mainly referred to GIB's refinancing of operational assets – and other respondents believed that these transactions did provide the market with needed liquidity at a time when it was in short supply. Over the past two and half years, in line with GIB's stated investment strategies, there has been a change in focus in OSW, from debt to equity and from operational refinancing to late-stage construction and most recently, construction.
- **W&B** – GIB appears to have also been successful in addressing liquidity issues in the W&B sector, where it stood in to help deliver a number of large scale municipal waste projects that were under threat due to the withdrawal of PFI support and mitigated shortfalls in capital supply in the wake of the financial crisis. Opinion has been mixed about whether GIB had invested sufficiently in projects using less mature technologies, with some suggesting that GIB has been too conservative in its project choices, whilst others recognised that some of GIB's fund investments have been in less proven technologies, particularly over the past 12 months. GIB has moved from investing in debt in large local authority supported transactions to smaller, merchant focused, equity investments using more innovative waste processing technologies. GIB has also had some success in using fund managers to deploy capital into the sector, but it is not yet clear whether these types of investment have the potential to be scaled up (and standardised) in a way that will attract the capital of large institutional investors to the sector.
- **NDEE** – Our survey responses corroborated our discussions with GIB staff, finding that the biggest obstacle to private capital in the NDEE sector is the diffuse and immature nature of markets, followed by inadequate transaction structures and products, which is a

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<sup>4</sup> These are included in GIB's 2013 and 2014 Annual Reports.

natural corollary of the fact that markets are not well developed. Although GIB has focused on these barriers, the Bank appears to have had less success in addressing them, relative to the OSW and W&B sectors. GIB has seeded a number of funds to invest in the sector in an effort to stimulate the aggregation of small transactions. Overall, it has deployed significantly less capital into the sector, suggesting that GIB has not identified enough “investment-ready” projects. Even though GIB’s deployment of funds to NDEE has been limited, market participants believed that GIB was moving in the right direction and helping the sector mature by putting in place a set of helpful financing structures and products (notably for Local Authorities and the health sector). Respondents remarked on the large team that GIB had assembled, with good understanding of the market and issues that it faced.

- **SS RES** – GIB has only been active in this sector for a short amount of time, which limited the extent to which we were able to evaluate its impact. GIB has committed capital to two investment vehicles, which aggregate small-scale projects together, and this commitment forms one of the largest pools of capital available in the sector. However, it has not deployed a significant amount of capital into projects to date and a number of market participants have suggested that there is not a clear role for GIB to play in this sector. This may reflect the short period of time that GIB has committed capital to the sector, as GIB believes the tenor of financing that it is willing to provide differentiates it from others serving the market.

A repeated point that emerges from our analysis is that GIB has been able to provide information about the sectors it invests in to help co-investors better understand risks, and has helped to disseminate best practice. Although other predominantly technical or advisory organisations might also be able to perform such functions, GIB’s status as an investor seeking to earn a commercial return on its investments is likely to provide it with incentives that differ from those facing other types of organisation, and also may make it more effective in identifying solutions and in demonstrating them to the wider market.

## Future role

The second major part of our work has been to examine the extent to which there remains a role for GIB in the UK’s green economy and what this role should look like in terms of the sectors covered, the products that GIB is able to offer to the market and the overall focus of the Bank.

The survey and follow-up interviews, along with discussions with both GIB staff and relevant government departments make up the main evidence base for our assessment.

In assessing the future role for GIB we have considered a wide range of green infrastructure sectors as possible areas for intervention by GIB. These sectors are shown in Table ES.1.

**Table ES.1**  
**Sectors Considered**

<b>Existing Sectors</b>	<b>Energy-related Technologies</b>	<b>Other Sectors</b>
Offshore wind	Carbon capture and storage	Agriculture, aquaculture and forestry
Waste & bioenergy	Energy efficiency (domestic)	Biodiversity offsets and ecosystems
Energy efficiency (non-domestic)	Energy storage	Land remediation
Small-scale renewables	Hydro power (large scale)	Water, including:
	Interconnectors (market to market)	- waste water treatment
	Low carbon transport	- water efficiency
	Nuclear	- catchment management
	Onshore wind (large scale)	- flood defences
	Smart metering	
	Solar PV (C&I rooftop)	
	Solar PV (domestic)	
	Solar PV (ground mounted)	
	Transmission and distribution	
	Wave and tidal	

First we considered GIB's potential future role in its current core sectors, which can be summarised as follows:

- **OSW:** Survey respondents indicated that GIB could continue to play a role in addressing the barriers to investment that continue to be present in the OSW sector. Notably interviewees highlighted that liquidity is less of an issue now than it was in 2012, the major need now being the provision of equity to earlier-stage construction projects. Some respondents suggested that GIB's involvement in operational projects might need to be reduced if it is to avoid competing with private investors and noted that the market might benefit from GIB focusing on riskier projects, such as those in deeper waters, employing new technologies, or at an earlier stage of the project life-cycle. This is in line with GIB's intention, from now on, only to invest in operational assets via its Offshore Wind Fund, which allows GIB's role to evolve from project investor to manager of institutional investment and frees up capital for GIB to focus on early-stage or otherwise riskier investments in the future.
- **W&B:** Technology risk – the top ranked barrier to investment – was the barrier that most survey respondents thought could benefit greatly from GIB's involvement. This is in line with comments we have heard through our interviews suggesting that GIB participation in standard energy from waste projects is no longer needed and that it should focus its attention on more immature technologies and in developing a product to reduce the risks associated with security of feedstock supply.
- **NDEE:** Our results for the NDEE sector give a strong indication that there is a role for GIB to make a positive contribution to breaking down the barriers to investment in the market. Most of the industry participants that we talked to agreed that this was a particularly difficult area into which to encourage investment, potentially requiring a step change in approach. Whilst different people offered different views on what GIB might do in the future to stimulate investment in non-domestic energy efficiency, a common theme emerged that GIB should consider offering products to the market that either required lower returns or took on higher risk than other commercial banks are prepared to



accept – essentially providing some form of concessionary finance, which is currently outside GIB’s mandate.

- **SS RES:** Of the four core sectors, the market participants that we spoke to were least in favour of maintaining GIB intervention in the small-scale renewables sector. Both government staff and investors suggested that the existing policy support in place for solar, onshore wind and small-scale hydro projects was sufficient to encourage the investment required to meet the UK government’s 2020 renewable targets for the electricity sector. The survey results seem to suggest that if GIB could develop a product that was able to aggregate a large number of relatively standardised small-scale projects with similar characteristics, this could provide a boost to the sector. It is too early to tell whether GIB’s seeding of two tailored investment vehicles could partially meet this need.

Across all of the sectors in which GIB has been active several respondents noted that GIB’s presence in a transaction provides reassurance to co-investors, citing the Bank’s relationship with government and alignment with government policy and objectives. The fact that government capital is invested in a project appears to offer some confidence to other project participants. Some market participants that we talked to also suggested that GIB is seen as a relatively impartial actor in a transaction which helps to facilitate the structuring and to accelerate the progress of deals. A few interviewees noted, however, that this could be affected if GIB’s close relationship to government were weakened.<sup>5</sup> A detailed consideration of the capital structure of the Bank and its possible implications for GIB’s ability to continue to meet its objectives was outside the scope of our review, however, so we have not explored this further.

Outside of the current core four sectors, we also considered GIB’s wider remit across green infrastructure. A reduction in the sector limitations would allow GIB to react more dynamically to changing needs, which as we highlight in our assessment of GIB’s impact to date (Chapter 5) have already been in evidence both within a sector as well as across different sectors. Identifying specific sectors that are accepted as priorities by Government does serve as a useful proxy for “green impact”, however.

Energy storage came out as the sector with the greatest need for GIB intervention in our survey, followed by CCS, wave and tidal, low carbon transport and domestic energy efficiency, all of which had a majority of responses suggesting the sector or technology had a need for GIB intervention. Our follow-up interviews also identified energy storage as a sector that GIB should consider in the near future, although new storage technologies are still at a relatively immature stage and are not yet “investment ready”. Respondents thought GIB could certainly play a role in large scale CCS, nuclear and tidal projects, which require significant financing for individual projects, and may initially lack sufficient private sector interest.

A clear message emerging from our review is that GIB’s role, as a complement to other policy measures, is most effective in encouraging the development of relatively immature sectors. It is an important tool where private sector financiers lack the resources to fully

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<sup>5</sup> The UK Government announced on 25 June 2015 that it was exploring the option of bringing private capital into GIB via a sale of part of the Government’s stake in the Bank (GIB is currently 100 per cent owned by the UK Government).

engage with and understand the technology and regulatory risks – but where the commercial proposition is nevertheless viable – usually because of complementary support policies. As the technology and regulatory landscape is continually shifting and developing – along with the resulting flows of capital – we think that it is appropriate for GIB to regularly assess where its public capital and expertise can be deployed most effectively. At the same time we still see benefits from focusing on specific green sectors that GIB and/or the government has singled out as particular priorities. With this in mind we have developed a high level framework to assist in evaluating the need for GIB, made up of key conditions for GIB’s involvement as well as proposals for metrics that provide the rationale for GIB to prioritise a particular sector.

Our proposed framework to assess potential sectors is intended as high level guidance, based on our assessment of the findings from our discussions with market participants, including government staff. A fully developed process would require a more detailed review of the suggested approach and consideration of the structure of the bank, both of which are beyond the scope of this study. We recommend that GIB involvement in a sector is likely to be most effective where:

- there are clear, credible green targets (at the UK, and potentially EU level);
- corresponding government policy is in place to create the right conditions for investors; and
- there are clear barriers to investment present in the sector, which are due to market failures.

We also suggest that GIB continues to prioritise its focus based on investment needs and, more precisely, based on the investment gap in sectors relative to historic financing trends.

As part of our assessment of GIB’s product offering, we carried out a review of other “green development banks” in order to compare them with GIB and to determine if there are any lessons to be learnt in relation to GIB’s future product offering. We considered KfW in Germany, the CDC in France, the European Investment Bank and the Clean Energy Finance Corporation in Australia. These banks offer a range of products and come from very different backgrounds. The CEFC, which was only set up in 2013, is perhaps closest to GIB in terms of its approach to investing on “market terms” (although CEFC does have the option of providing concessional finance). All of the banks we reviewed, however, differed notably from GIB in that they provided some concessionary finance or credit enhancement products.

We asked our survey respondents which product offerings would attract the most private capital to the green economy. Many of the different product options elicited mixed reactions from across our sample. A role for GIB to act as a guarantor of private debt issuance came out as the option which respondents believed would attract the largest amount of capital to the sector, with over 40 per cent of respondents stating that it would attract a “large volume” of capital, and a further 44 per cent saying that it would attract a “moderate volume” of capital. GIB investing in demonstration projects appears to be the second best option in terms of attracting more capital. Common amongst the responses we received regarding GIB’s future product offering in other, non-core, sectors was the proposal that GIB take on a role in both encouraging the development of riskier projects than commercial banks might currently be prepared to invest in and in developing tools that might help standardise the investment process and transaction structure.

Many of the suggestions we received, however, would contradict GIB's current business model which is centred on investing alongside private capital at market terms – a role which is clearly also valued by many project developers and co-investors – unless market participants were willing to co-invest alongside GIB through the proposed new instruments, where private investors offer terms that differ from GIB's concessionary terms.

## 1. Introduction

In launching the UK Green Investment Bank plc (GIB) in 2012, the Department for Business Innovation & Skills (BIS) committed to review its impact after an initial few years of operation. NERA Economic Consulting has been commissioned to undertake this review and to consider GIB's future role over the period to 2020 and into the next decade. The NERA project team has partnered with Clean Infra Partners, specialising in Climate Finance advisory, to deliver this assignment.

GIB was created by the UK Government as a “for profit” bank to accelerate the UK's transition to a “green economy”. It was officially launched on 28 November 2012, following State Aid approval by the European Commission (EC). GIB is currently 100 percent owned by the UK Government and has £3.8 billion of capital available to invest in green projects by March 2016. GIB uses these funds to back green projects<sup>6</sup> on commercial terms with the aim of mobilising other private sector capital into the UK's green economy. In a report to the UK Government making the case for GIB, Vivid Economics estimated that the transition to a green economy may require infrastructure investments of up to £330 billion over the decade from 2011 to 2020.<sup>7</sup>

GIB aims to invest in a way that demonstrates the attractiveness of green investments to others, by showing that it is possible to invest in projects that are both green and profitable. As an institution investing public money GIB must balance this purpose with government policy ambitions and comply with State Aid restrictions. These restrictions currently determine both the sectors GIB is permitted to invest in and the manner in which it can invest. GIB's investment activity to date has been limited to four “core” sectors:<sup>8</sup>

- Offshore wind
- Waste & bioenergy
- Non-domestic energy efficiency
- Small-scale renewables

BIS and GIB commissioned this report to serve as a robust assessment of the case for continued intervention by GIB to accelerate investment in the green economy. The information and analysis presented in this report is expected to be relevant for use in a number of different contexts, which might potentially include: BIS monitoring and evaluation of the GIB, the UK Government's Spending Review, potential reviews by the National Audit Office (NAO) or the Public Accounts Committee, and any future State Aid applications, should they be necessary and forthcoming.

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<sup>6</sup> We set out GIB's interpretation of “green” below in the introduction to Chapter 3.

<sup>7</sup> Vivid Economics, *The Green Investment Bank: Policy and Finance Context*, October 2011.

<sup>8</sup> The UK Government's State Aid application for GIB contained offshore wind, non-domestic energy efficiency and waste infrastructure as “priority sectors”, while “biomass power” and “non-innovative waste management” were treated as “non-priority”, but still within GIB's remit (see Slaughter and May, *Green Investment Bank – UK Government Level 1 State Aid Notification to European Commission*, 2012). In later discussions with the EC, the UK Government obtained State Aid clearance for GIB to invest in small-scale renewables.

To evaluate GIB's impact in its core sectors and assess its future role we have carried out a survey of market participants with activities across the different aspects of the green economy. To supplement this evidence base we have also carried out many interviews to discuss both the historic and forward-looking parts of our work with GIB staff, several government departments, investors in green infrastructure and project owners and developers.

Our report is structured as follows. Chapter 2 provides some background and context to GIB's role, first presenting the market failures and resulting barriers to investment in the green economy, before discussing the rationale for GIB as a policy tool. Chapter 3 then sets out GIB's activities to date, largely based on meetings we have held with GIB staff, and on both public and private data that GIB has shared with us for this study. Chapter 4 covers our methodology for assessing GIB's impact to date as well as our identification and prioritisation of its potential future role. Chapter 5 presents the evidence that we gathered as part of this study and sets out our assessment of GIB's impact to date, and Chapter 6 sets out our findings about its potential future role, including options for GIB's future product offerings, before concluding in Chapter 7.

## 2. Background

### 2.1. Market Failures and Investment Barriers in the Green Economy

Guidance on policy appraisal and evaluation in the UK is set out in the Treasury's *Green Book*. To justify government action there must first be a clear, identified need which is in the national interest for government to address, and second, the benefits of the proposed intervention must be expected to be worth the cost. In discussing the rationale for government intervention, *The Green Book* notes that:

“This underlying rationale is usually founded either in market failure or where there are clear government distributional objectives that need to be met. Market failure refers to where the market has not and cannot of itself be expected to deliver an efficient outcome; the intervention that is contemplated will seek to redress this. Distributional objectives are self-explanatory and are based on equity considerations.”

It goes on to say that:

“Government intervention can incur costs and create economic distortions. These must be taken into account to determine whether intervention is warranted. For example, a regulation may be successful in addressing a particular market failure, but might also involve other costs that mean that overall it is not worthwhile.”<sup>9</sup>

Environmental policy goals are often motivated by a failure to price (negative) externalities. The Impact Assessment carried out by BIS prior to the introduction of GIB noted that “the overarching market failure is environmental externalities, where the impact of an activity on the environment is not fully priced into the market”.<sup>10</sup>

Greenhouse Gas (GHG) emissions are a well-known example of a negative externality in the context of environmental regulation. The environmental costs associated with climate change that are borne by society at large have led governments to impose costs on firms that emit GHGs as a by-product of their activities (in the form of carbon taxes and the EU Emissions Trading System – see below). Without government intervention to create these private costs, the market would deliver an outcome with excessive emissions relative to the social optimum, taking into account the environmental costs.

Capping the level of emissions in the economy, as has been done for the UK through the Climate Change Act, is a way of dealing with this problem. Under the 2008 Climate Change Act, the UK committed to reducing its greenhouse gas emissions by 2050 by at least 80 percent relative to the 1990 baseline. As a roadmap towards achieving this target, the UK government has established four “Carbon Budgets” (to date) restricting the amount of greenhouse gases the UK can emit until 2027. A complementary measure at the European level is the EU Emissions Trading System (ETS), which contains a separate emissions cap for around 11,000 energy-intensive installations in Europe. Through a system of tradable

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<sup>9</sup> HM Treasury, *The Green Book: Appraisal and Evaluation in Central Government*, 2003.

<sup>10</sup> BIS, *Impact Assessment: UK Green Investment Bank*, 15 May 2012.

emission allowances, the ETS ensures that its reduction target is achieved in a cost-effective manner because the trading of allowances allows reductions to happen in those places where they cost least. Having a market for allowances also has the effect of putting an added price on emissions, which goes some way towards internalising the negative externality, i.e., ensuring that emitters pay the environmental cost of their emissions. Achieving these and related commitments – for example, the UK’s requirement under the EU Renewable Energy Directive to produce 15 percent of its energy from renewable sources by 2020 – translates into a sizable need for new investment in “green” infrastructure and innovation estimated to be of the order of £33bn per year.<sup>11</sup>

GHG emissions are by no means the only externality, or source of market failure, in the green economy. Air and noise pollution as well as visual disamenity are all additional examples of negative environmental externalities. Different uses of land and natural resources can harm, or benefit, ecosystems and areas biodiversity. On the other hand, innovation can lead to *positive* externalities, where people or firms benefit from the research and development activities of others without directly paying for these benefits. Better internalisation of environmental externalities augments the profitability of “greener” businesses by serving to put them on a more level playing field with less green competitors. Increased profitability should, in turn, help attract additional private investment into green businesses.

Capital markets match sources of capital – such as utilities, banks or institutional investors – with (green or conventional) investment projects in need of funding. The BIS Impact Assessment of GIB noted that, in addition to environmental externalities, there are:

“a number of market failures and barriers that manifest in financial markets and constrain the supply of finance, including: financial market capacity constraints, risk aversion due to imperfect information and information asymmetries, positive spillovers in knowledge, high financing transaction costs and coordination problems.”<sup>12</sup>

The motivation for establishing the GIB has been to contribute to the achievement of the UK’s environmental targets by addressing capital market failures in the sectors where investment is required to meet these targets. The GIB is intended to complement other policy interventions – such as direct regulation, taxation of externalities, or the use of market-based instruments. GIB’s activities are intended to help the UK meet its green targets either at lower cost, or with fewer adverse distributional impacts, than other policies could on their own.

We first set out and discuss the underlying market failures noted by BIS and then categorise how these manifest themselves in barriers to private investment. The key market failures that underpin why green investment projects may fail to attract sufficient capital include:

- **Imperfect information available to investors:** A fundamental feature of every investment project is that potential investors have imperfect information about the many

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<sup>11</sup> Vivid Economics, The Green Investment Bank: Policy and Finance Context, October 2011.

<sup>12</sup> BIS, Impact Assessment: UK Green Investment Bank, 15 May 2012.

variables affecting future profitability. Given the relative novelty of the markets, policies, and technologies relevant to “green projects”, however, these uncertainties tend to be more pronounced. Capital available for such projects therefore is often limited by investors’ unfamiliarity. The costs of overcoming this unfamiliarity – in both time and expenditure – may make such investments less attractive than the alternatives.

- **Positive spillovers:** A second feature of many green investment projects are positive spillovers associated with technological or financial innovation, or with the demonstration of previously untested technologies. Since early adopters of these technologies receive no “payment” for this external benefit that is shared with the wider market, there will be under-investment relative to what would be optimal taking into account the benefit.
- **Incentives of managers making investment decisions:** A third factor lowering investment in green projects, relative to the economically efficient level, are the motivations and incentives of the individuals making the investment decisions (“managers”). Of particular relevance in this context is myopia, which means that managers discount future profits too heavily, making them biased towards immediate returns. Myopic managers may focus too much on the immediate expenditure, while disregarding the future savings. Other examples are where internal or external budgeting and investment rules restrict the types of investments that can be considered and exclude otherwise profitable investments; or where contractual arrangements (for example, between landlords and tenants) make it difficult to share the benefits of investment in ways that all parties would agree justified a project. (This applies, for example, to energy efficiency investments, where a substantial capital expenditure today enables cost savings over many years to come, but these benefits may not be valued by the landlord who would own the asset but is not able to monetise a return on the extra investment.)

These market failures result in (perceived) risk-adjusted returns that are often not considered sufficiently attractive by potential financial investors. If the barriers to investment created by the above market failures can be overcome or at least reduced through policy intervention, this will stimulate investment in the green economy. GIB’s own analysis of investment in the green economy has identified five key barriers, which we have used as a common theme throughout this study to inform our assessment approach both with respect to GIB’s achievements in addressing the barriers to date and in relation to its potential future role. These barriers are:

- Technology risk
- Regulation
- Diffuse and immature markets
- Inadequate transaction structures and products
- Lack of liquidity.

Further details on these barriers are presented in Box 2.1 below.



### Box 2.1 Barriers to Investment in the Green Economy

**Technology risk:** Technology risk is a manifestation of imperfect information. It also stalls the uptake of new technologies and therefore reduces the knowledge spillovers associated with technology deployment.

**Regulation:** Uncertainty about regulation contributes to imperfect information and increases the perceived riskiness of investments, for example, through uncertainty about future subsidies offered to green projects. Regulation may also fail to reward investors for positive spillovers, for example, by not providing sufficient support to early adopters of innovative technologies.

**Diffuse and immature markets:** Diffuse and immature markets may be a consequence of not enough market learning about new technologies, which limits the pipeline of investment opportunities. Fragmented markets may also remain immature because of a lack of standardisation and associated high transaction costs resulting from imperfect information.

**Inadequate transaction structures and products:** This barrier arises from a lack of investment structures and products available in the market for overcoming the above-mentioned market failures. For example, existing structures may offer no way around managers' tendency to focus on immediate costs and disregard future savings. It may also be the case that long-term investors are not matched to assets with high upfront costs and long payback periods due to a lack of products that suitably structure the investment to make it sufficiently attractive to the capital provider.

**Lack of liquidity:** Lack of liquidity refers to such things as the tenor of funding being too short given the lifetime of projects or markets for recycling early-stage investments ("secondary markets") being underdeveloped. Lack of liquidity is mainly a symptom of an underlying market failure (e.g., imperfect information). However, there may be merit in policy makers tackling the liquidity problem directly, rather than addressing the root cause, which may be harder to cure.

## 2.2. Rationale for a Green Investment Bank

The barriers to private investment in the green economy described in the previous section may prevent the UK from achieving its green targets, and this creates a case for government to tackle these barriers through policy interventions in the relevant markets. There are a number of different policy instruments that a government could employ to correct the underlying market failures. BIS laid out various policy options in its 2012 impact assessment examining the creation of a UK Green Investment Bank, of which the creation of a new bank was only one.<sup>13</sup> Other options included maintaining the status quo characterised by a long list

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<sup>13</sup> BIS, Impact Assessment: UK Green Investment Bank, 15 May 2012.

of policy instruments (e.g., Renewables Obligation, Contracts for Difference, Climate Change Levy, Smart Metering, Renewable Heat Incentive, Landfill Tax) and simply enhancing existing instruments (e.g. setting higher subsidies and taxes to a level that would improve expected returns and improves the attractiveness of investments).

Ultimately, the creation of GIB emerged as the government's preferred option. One of the reasons for this was that GIB's investments could be targeted at specific areas deemed to be most in need of support, or where spillover benefits would be greatest. In contrast, existing mechanisms, by supporting (or imposing costs on), a much wider set of projects, would involve financial transfers of much larger amounts to achieve similar effects. There are therefore both distributional and (assuming GIB is able to identify and select projects with information and spillover benefits) efficiency reasons for preferring GIB.

From a conceptual point of view, a green investment bank represents a particular kind of "public financial institution" making government-mandated investments in the green economy.<sup>14</sup> In this context, a recent OECD report distinguishes the following potential functions of public financial institutions:<sup>15</sup>

1. Providing long-term capital – private sector lenders often have constraints over the tenor that they are able to offer to project developers, which creates a mis-match between the needs of the borrower and the product offerings of lenders.
2. Facilitating access to private capital – smaller projects, using relatively nascent technologies may not have an accessible route to the providers of capital. A green investment bank can introduce private capital to new sectors and help investors understand the potential rewards (and risks) available.
3. Risk sharing – a green investment bank with a sound reputation for understanding a given sector can provide reassurance to co-investors by investing alongside them, reducing their exposure to the project and providing "skin in the game" to signal confidence in the project.
4. Credit enhancement mechanisms – sectors or projects that lack a proven track record may benefit from credit enhancement measures, which a green investment bank, with government backing, is better placed to provide than the private sector.
5. Aiding project development – a green investment bank may target particular "strategic" projects for investment or provide financing at the pre-construction or construction stages of a project where commercial investors may be less comfortable understanding and pricing the risks.
6. Reducing project risks – a green investment bank may take on additional risk to a private investor to help provide financing at riskier stages of the project lifecycle, thereby making the project more attractive to other, private sector investors.

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<sup>14</sup> Green investment banks are special because of their exclusive focus on green investments. However, there are many other public financial institutions with a partial mandate for investments. An example is Germany's Kreditanstalt für Wiederaufbau, which invests heavily in energy efficiency, but whose investment focus is not exclusively "green". This and other examples are further discussed in Section 6.7.2.

<sup>15</sup> Cochran et al, Public Financial Institutions and the Low-carbon Transition, OECD Environment Working Paper, 2014

As we discuss in the next chapter, to date GIB has mainly focused on 1-3, with some examples of targeting strategic projects and construction risk (5). It has abstained from credit enhancement (e.g. through loan guarantees) and taking on additional risks to make investments more attractive to private investors. The activities that the OECD report sets out go beyond what most market participants are prepared to offer – particularly in 4-6, which involve offering subsidised rates or taking on riskier positions within transactions than a private investor is willing to do. GIB’s investment approach is explicitly “at market”. To date, it has put little emphasis on direct de-risking of green projects through differentiated risk taking, although one could argue that it has sought to de-risk projects by better quantifying and helping co-investors to understand the risks, thereby changing the perception of the market via analysis and demonstration.

### 3. GIB's Activities to Date

In this chapter we present GIB's activity from the time it was set up in 2012 until early 2015. Much of the information included in this chapter is based on data provided to us by GIB, which is mostly available in the public domain, as well as discussions we have held with GIB staff. The chapter therefore largely presents GIB's own views of the challenges facing different sectors and GIB's description of the steps it has taken to crowd-in private capital, encourage innovation and look to lower the cost of capital across the following four sectors of the UK green economy:

- Offshore wind
- Waste & bioenergy
- Non-domestic energy efficiency
- Small-scale renewables<sup>16</sup>

Having presented this analysis of GIB's activity to date from its own perspective, we then supplement it with the evidence we have gathered from other market participants, and with our own analysis, in subsequent chapters.

As noted above, one of GIB's founding "operating principles", laid down in the UK government's State Aid application, is that it must be "additional" to the market.<sup>17</sup> Additionality has two dimensions: First, GIB must not crowd out investment in the sense of not displacing private investors who would have stood ready to invest in a project instead of GIB. This also implies that GIB must invest on "as close to commercial terms as possible".<sup>18</sup> GIB's preferred approach to meeting these requirements is to invest alongside others on a *pari passu* basis, i.e., on the same terms as its private sector co-investors. Second, GIB's aim should be to crowd in investment, which means that its involvement in a project has the effect of attracting additional private capital to the project. Ideally this means that GIB should seek to *efficiently* crowd in investment by countering or correcting market failures, without either directly subsidising the project (and other financial investors) or by taking on additional risk, which has the effect of reducing the risks faced by others.

In addition to earning commercial returns on all its investments, GIB's mission includes only investing in projects with a positive environmental impact in line with at least one of its "green purposes":

- Reduction of greenhouse gas emissions
- Advancement of efficiency in the use of natural resources

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<sup>16</sup> Because GIB's involvement in the small-scale renewables sector is relatively recent, we devote significantly less time to it.

<sup>17</sup> See: Slaughter and May, Green Investment Bank – UK Government Level 1 State Aid Notification to European Commission, 2012, pp. 4 and 122.

<sup>18</sup> Otherwise, the requirement that no one else must be prepared to invest on the same terms as GIB would not make much sense. See Slaughter and May, Green Investment Bank – UK Government Level 1 State Aid Notification to European Commission, 2012, p. 122.

- Protection or enhancement of the natural environment
- Protection or enhancement of biodiversity
- Promotion of environmental sustainability

GIB has internal processes in place to estimate the environmental impact of each project based on a set of metrics that are informed by these green purposes. There are currently no explicit de minimus requirements across all of the purposes (or their corresponding metrics). It is therefore possible that a project which scores highly against one of the green purposes is approved to receive GIB financing, even if it has a neutral (or even a negative) impact when measured against another metric. GIB also does not rank and then allocate financing to projects based on their green credentials. This is largely explained by the fact that GIB has not faced binding capital constraints to date, so there is not excess demand for GIB's funds from projects that otherwise satisfy its conditions for investment.

Based on our discussions with GIB staff we understand that the green credentials of each project, and the potential for any negative impacts, are closely scrutinised in the project evaluation phase prior to receiving any investment approval. We are also aware that GIB is continuing to develop both its measurement of various types of green impact as well as considering how this could be used to prioritise its focus in the case that GIB has to select from amongst competing demands on its capital.

The co-existence of GIB's two sets of objectives – to earn commercial rates of return investing in infrastructure assets that have a positive environmental impact – can be expressed as an aim to be both “green and profitable”.<sup>19</sup>

### 3.1. GIB's Investment Activities to Date

Figure 3.1 shows GIB's total investment across its current sectors of activity, namely offshore wind (OSW), waste & bioenergy (W&B), non-domestic energy efficiency (NDEE) and small-scale renewables (SS RES). For each sector, the “GIB” total comprises all its direct debt and equity investments as well as all investments undertaken by fund managers on GIB's behalf, whereas “Co-Investment” refers to all investment undertaken by other private investors alongside GIB in the context of these transactions. The data underlying Figure 3.1 is shown in Table 3.1. The table also shows the “mobilisation rates,” defined as the ratio of private co-investment to GIB's investment. The average mobilisation rate across all investments is 3.4 (meaning that each £1 invested by GIB was accompanied by a co-investment of £3.4), with considerable heterogeneity across sectors.<sup>20</sup>

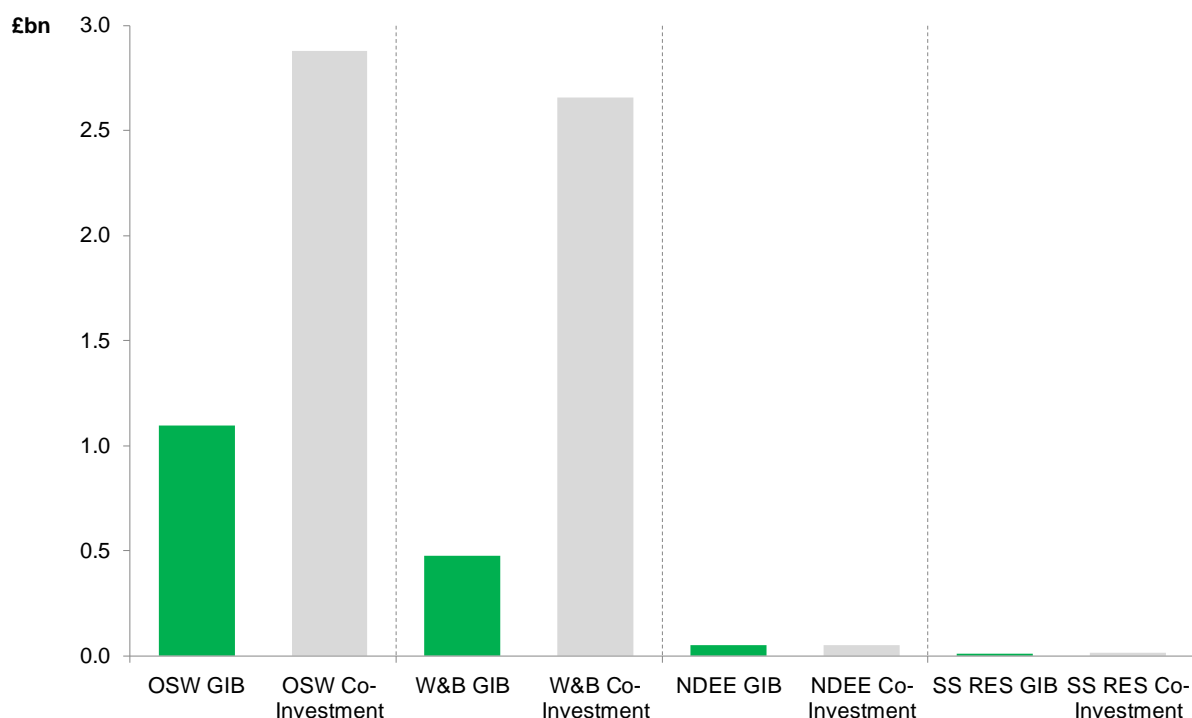
The largest share of GIB's investment activity has been in offshore wind (£1.1 billion committed to projects), followed by waste and bioenergy (£0.5 billion), with a much smaller

<sup>19</sup> See e.g. GIB, Annual Report 2014, p. 8.

<sup>20</sup> The mobilisation rates are calculated from GIB's *cumulative* investment in each sector and the accompanying private investment - without taking into account any subsequent divestments. Taking divestments into account would increase the mobilisation rate for OSW to 2.9, and the overall mobilisation rate to 3.7, owing to GIB and a co-investor partly refinancing an equity stake that they had previously jointly acquired in the Westernmost Rough offshore wind farm.

amount of capital funding energy efficiency and small-scale renewables. The mobilisation rate has been highest for the waste and bioenergy sector, followed by offshore wind.

**Figure 3.1: Investment in the UK Green Economy by GIB and Co-Investors as of May 2015 by Sector**



Source: NERA analysis of GIB data

**Table 3.1: Investment in the UK Green Economy by GIB and Co-Investors as of May 2015 by Sector**

Sector	GIB £m	Private Co- Investment £m	Mobilisation Rate
OSW	1,095	2,881	2.6
W&B	474	2,658	5.6
NDEE	49	51	1.0
SS RES	10	15	1.5
<b>Total Investment</b>	<b>1,629</b>	<b>5,605</b>	<b>3.4</b>

Source: NERA analysis of GIB data

Figure 3.2 shows GIB's total investment and associated co-investment by *type* of investment, rather than by sector. "Debt GIB" and "Equity GIB" include all direct debt and equity investments undertaken by GIB, while "Co-Invest Debt" and "Co-Invest Equity" contain all investments by other private investors in the course of these transactions. In the case of GIB's debt investment, these co-investments tend to be also debt as equity is already committed, while they are typically a mixture of debt and equity for GIB's equity investments. "Invest via Fund GIB" comprises all debt- and equity investment made not by GIB directly, but by one of the funds capitalised by GIB, while "Co-Invest Fund" covers all investments by others in these transactions. Finally, "Capitalisation GIB" shows GIB's capitalisation of these funds,

i.e., how much it has committed to them, rather than the capital actually deployed (which is less, because not all of the committed capital has yet been invested). The gap between capitalisation of funds and actual deployment of capital varies across sectors (see the following sections).

**Figure 3.2: Investment in the UK Green Economy by GIB and Co-Investors as of May 2015 by Investment Type**



Source: NERA analysis of GIB data

**Table 3.2: Investment in the UK Green Economy by GIB and Co-Investors as of 20 May 2015**

Type	GIB	Private Co-Investment	Mobilisation Rate
	£m	£m	
Debt	404	2,598	6.4
Equity	1,089	2,803	2.6
<i>Regular</i>	629	1,965	
<i>Refinancing</i>	-	378	
<i>Recycling</i>	460	460	
Investment via fund	136	204	1.5
<b>Total Investment</b>	<b>1,629</b>	<b>5,605</b>	<b>3.4</b>
Capitalisation	540		
<b>Total Commitment</b> (Debt + Equity + Capitalisation)	<b>2,033</b>		

Source: NERA analysis of GIB data

The data behind Figure 3.2 are shown in Table 3.2 along with associated mobilisation rates. Because of some special features of the underlying transactions, “Co-Invest Equity” is further broken down into “Regular”, “Refinancing” and “Recycling”. “Refinancing” refers to a single transaction through which GIB refinanced a substantial part of an equity stake that it

holds in the Westermost Rough offshore wind farm.<sup>21</sup> “Recycling” refers to two transactions again in OSW (Gwynt y Mor and Sheringham Shoal) that saw GIB purchasing equity stakes in wind farms without any co-investors. Instead, GIB obtained assurances from the vendors that they would reinvest the proceeds from these sales in the UK offshore wind sector. GIB has counted these assurances as commitments of capital to the sector.<sup>22</sup> Next to GIB’s investment and associated co-investment, the table also shows GIB’s “total commitment” to the green economy, which is given by the sum of its debt and equity investments on the one hand and its capitalisation of funds on the other.

The mobilisation rates shown in Table 3.2 are highest for debt because for many debt transactions GIB tended to be part of larger consortia of debt providers. The mobilisation rate has been lowest for investments via funds, where the GIB-appointed fund managers typically match the investment on GIB’s behalf with an equal investment from other funds managed by them (with a view to satisfying GIB’s requirement of at least equal co-investment on these transactions).

In the following sections, we provide a breakdown of these totals and describe salient features of GIB’s transactions in each sector. Our discussion is structured by the “barriers to investment” framework introduced above in Section 2.1. Importantly, as noted above, in this chapter, we limit ourselves to relating our understanding of *GIB’s own view* of each sector, as we have established it through meetings and interviews with GIB staff as well as consulting GIB’s internal and external documentation of its investment activity. In Chapter 5 we present our analysis of the views of *other market participants* on the impact that GIB has had on its sectors of activity.

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<sup>21</sup> As discussed above, this transaction resulted in a partial *divestment* by GIB and its co-investor Marubeni from OSW. As our focus is on GIB’s cumulative *investment* activity and its impact on the sectors receiving the investment, we ignore this fact in the summary statistics shown in this report.

<sup>22</sup> NERA has reviewed a number of “recycling letters”. While they lack legal force, they imply a basic form of commitment. In our summary statistics, we ignore the fact that these sales amount to an initial divestment from the green economy on the part of the vendors (which they have indicated will be returned to the sector via the development of new projects).



### 3.1.1. Offshore wind

Relative to GIB's other sectors of activity, offshore wind (OSW) projects tend to be particularly large and complex, which translates into potentially large barriers to private investment at the different stages of the project life cycle (development, construction, operation). Specifically, GIB identified the following barriers that existed prior to its involvement in OSW:

**Technology risk:** GIB became involved in the sector in a time of transition towards more powerful turbines, with a capacity of 6 MW and more. This transition implied technology risk arising from the adoption of turbine models that had not previously been deployed at commercial scale.

**Regulation:** When GIB entered the sector, there was uncertainty about the future support regime for OSW as a result of the on-going Electricity Market Reform in the UK.

**Diffuse and immature markets:** The OSW sector was characterised by large scale individual projects with limited access to financial markets in 2012, be it for raising long term limited recourse finance or recycling development and construction capital.

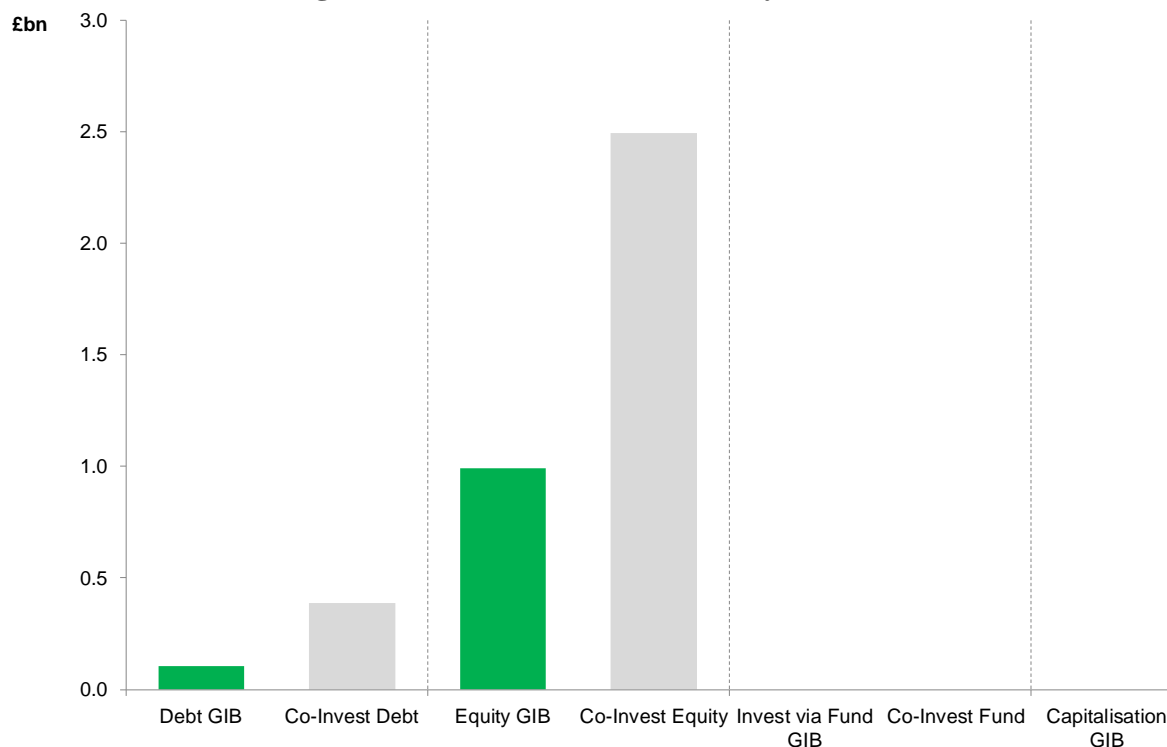
**Inadequate transaction structures and products:** The characteristics of operational OSW assets make them well-suited for investment from institutional investors, who have large amounts of capital to deploy and seek stable returns over a long time. Yet, when GIB became active in OSW, institutional investors were finding it difficult to adequately appraise the risk-return profile of single projects and thus had not deployed capital to the sector. Investors' risk assessment of individual projects was not being adequately compensated by expected returns. Since few operational assets existed in the UK at the time, removing this barrier, through project de-risking, was in part a matter of enough projects advancing to operational stage. However, even with a sufficient number of operational projects, it became apparent that an aggregation vehicle was needed in order to deploy equity from institutional investors, given their reluctance to commit to single projects in the sector.

**Lack of liquidity:** Two distinct liquidity issues have been present in the OSW sector since 2012. First, there was the inability of OSW project developers and potential investors to mobilise long-term limited recourse debt in 2012, as an aftermath of the financial crisis and given lenders' reluctance to expose themselves to OSW construction and regulatory risks at the time, as well as concerns over the rating agencies treatment of any debt raised. Second there have been a lack of exit options for project developers, which meant that a few large project developers were constrained by their own balance sheet (and desire to limit corporate leverage). When GIB became active in the sector, very few secondary equity investments had taken place at the project level, resulting in barriers to early-stage investment.

GIB's investment activity in OSW has been via direct investments, rather than via funds (which it has used in other sectors as a means to deploy capital). As shown in Figure 3.3, by May 2015 GIB had invested £104 million of debt alongside a total co-investment of £386 million, which corresponds to a mobilisation rate of 3.7. On the equity side GIB had invested

almost £1 billion of equity with co-investments totalling nearly £2.5 billion, implying a mobilisation rate of 2.5.<sup>23</sup>

**Figure 3.3: GIB Investment Activity in OSW**



Source: NERA analysis of GIB data

Behind these numbers are seven transactions. In two of them (Walney and London Array), GIB refinanced minority interests in operational wind farms. The Walney transaction involved a refinancing of an equity bridge loan made by the initial project developer DONG (Denmark's largest energy company, a majority of which is owned by the Danish state) to two financial investors, who had acquired minority interests. This financing was provided via a separate holding company structure as an Incorporated Joint Venture (IJV).<sup>24</sup> The second one was an innovative refinancing of the 20 percent interest held by the Abu Dhabi-based renewable energy investor Masdar in the London Array project, which is structured as an Unincorporated Joint Venture (UJV).<sup>25</sup> These represented the first times that lenders became involved in IJV/UJV structures in the UK offshore wind sector. These were the only two debt transactions that GIB was involved in. GIB subsequently identified that there was less of a

<sup>23</sup> The rate for equity would be higher if we took into account the partial divestment by GIB and its co-investor Marubeni from OSW resulting from the refinancing of their equity stake in the Westernmost Rough offshore wind farm.

<sup>24</sup> An Incorporated Joint Venture (IJV) involves a project company owning the underlying assets, in which a number of parties ("sponsors") make a joint equity investment. In an Unincorporated Joint Venture (UJV), there is no project company owning all the assets. Instead, there is a Joint Operating Agreement, which is a contractual arrangement between parties to jointly develop and manage the project's assets. For the financing of the assets and other issues such as operation and maintenance, additional contracts may exist with third parties.

<sup>25</sup> See footnote 24.

need for debt in the market and turned its focus to the equity side of offshore wind projects, which explains why most of GIB's capital in the offshore wind market has been invested in equity.

Two further transactions (Rhyl Flats and Sheringham Shoal) consisted of GIB buying equity stakes in operational wind farms from utilities (RWE and Statoil/Statkraft, respectively), with a view to increasing liquidity in the secondary equity market (i.e., helping developers "recycle" their capital). This was a clearly articulated component of GIB's OSW investment strategy. What is more, GIB later transferred both equity stakes to its newly established OSW Fund designed to meet the needs of institutional investors who wished to have portfolio exposure to offshore wind – either instead of, or in addition to, direct project investments.<sup>26</sup> Two transactions saw GIB purchasing an equity stake either conditional on the completion of construction (Gwynt y Mor) or taking on genuine construction risk (Westermost Rough).<sup>27</sup> Again, the aim of these two transactions was to ensure the projects were built, prove that project developers can take development risk but not have to fully fund the construction and operational phases and, in the case of Westermost Rough, to accompany the Japanese infrastructure investor Marubeni in its second project finance investment in the UK offshore wind sector and its first involving construction risk. These transactions reflected a shift in GIB's OSW investment strategy towards construction-stage investments, which GIB had previously anticipated.<sup>28</sup> The second transaction also addressed technology risk as Westermost Rough featured the first ever commercial deployment of a new Siemens 6 MW turbine.<sup>29</sup>

In May 2015, GIB announced its investment in a seventh OSW project (Rampion). This acquisition of a minority interest in a project being developed by E.ON indicates GIB's willingness to invest at the late development stage of a project, which in this case was instrumental in getting the project sponsor to take the Final Investment Decision.<sup>30</sup>

Table 3.3 summarises the preceding paragraph by indicating which of GIB's investments address the barriers to private investment identified above, according to GIB's own assessment. Further details on all of GIB's transactions in OSW can be found in Appendix A. As for the "Regulation" barrier, the main issue was uncertainty arising from the UK's on-going Electricity Market Reform. In this context, GIB's presence in the sector signals the government's commitment to creating favourable conditions for private investment in OSW (because the government has itself put "skin in the game" by investing via the GIB). The

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<sup>26</sup> The "first close" of GIB's OSW fund was announced on 1 April 2015. In purchasing the equity stakes it later transferred to the fund, GIB had negotiated conditions to ensure the assets were appropriately structured to be attractive to institutional investors, rather than following existing models designed more for utility ownership.

<sup>27</sup> Gwynt Y Mor is expected to become fully operational in the third quarter of 2015.

<sup>28</sup> See GIB's 2013 and 2014 Annual Reports.

<sup>29</sup> GIB and Marubeni have now refinanced a substantial part of their equity stakes in WMR with Senior Debt. This is the first time a holding company investment has been financed during construction. This has freed up capital for investment at earlier stages of the project life cycle.

<sup>30</sup> The Rampion project is included in the investment data shown in this chapter, but not in our survey, as the transaction was announced after our survey was launched and, given the timing, we were only able to discuss it with a limited number of interviewees. The coverage of this project in this study is therefore only partial.

hope is that this in itself already goes some way towards comforting investors. In addition, GIB's due diligence of regulatory risk helped investors to understand, and become more comfortable, with them. Finally, in the context of missing products for institutional investors, GIB's establishment of the first dedicated fund for offshore wind assets represents a step towards pulling in wider sources of capital to invest in the sector. (Similarly, the Bank's earlier work with BIS and Greencoat Capital in establishing Greencoat's UK wind "yieldco", which also caters to institutional investors and has a share invested in offshore wind, has helped to demonstrate the viability of such financing models in the UK in general).

**Table 3.3: Barriers to Investment in OSW and GIB Investment Response**

Barrier Type	Manifestation	Main GIB Investment Response
Technology risk	New generation of turbines (Siemens 6 MW)	Westermost Rough
Regulation	Uncertainty about operation of, and level of future support under EMR	"Skin in the game" and due diligence of regulatory risk
Diffuse & immature markets	Limited recycling options for project developers	Gwynt y Mor, Westermost Rough, Rhyl Flats, Sheringham Shoal, Rampion
Inadequate structures & products	Lack of products for institutional investors	Offshore Wind Fund (Rhyl Flats, Sheringham Shoal); Greencoat
Lack of liquidity	No market for long term limited-recourse debt financing in 2012	Walney, London Array

### 3.1.2. Waste & Bioenergy

The Waste & Bioenergy (W&B) sector is characterised by a diverse mix of technologies (conventional biomass, anaerobic digestion, different gasification technologies), sources of feed stock (agriculture and forestry, household waste, commercial and industrial waste) and regulatory frameworks (subsidy regimes, public-private financing models, sustainability criteria). The following barriers to private investment existed before GIB became active in the sector:

**Technology risk:** Technology risk refers to the (lack of) maturity of the technology used in the project and the extent to which investors are able to accurately forecast the project costs and revenues given the track record of the technology in similar projects. This was an important barrier in the waste sector. Waste gasification in particular featured various new technologies that were inadequately understood by investors.

**Regulation:** Risks arising from regulation translated into significant barriers. Of particular relevance was the uncertainty surrounding public subsidies for renewable electricity and heat

(RO, CfDs, RHI) and the uncertain future of the PFI model after the UK government's funding withdrawal in 2013.<sup>31</sup>

**Diffuse and immature markets:** Facilities processing merchant waste of commercial and industrial (C&I) origin – as opposed to household / municipal waste supplied under long-term contracts with local authorities – were seen as suffering from feedstock supply risks. Such perceptions had limited the development of this segment of the market.

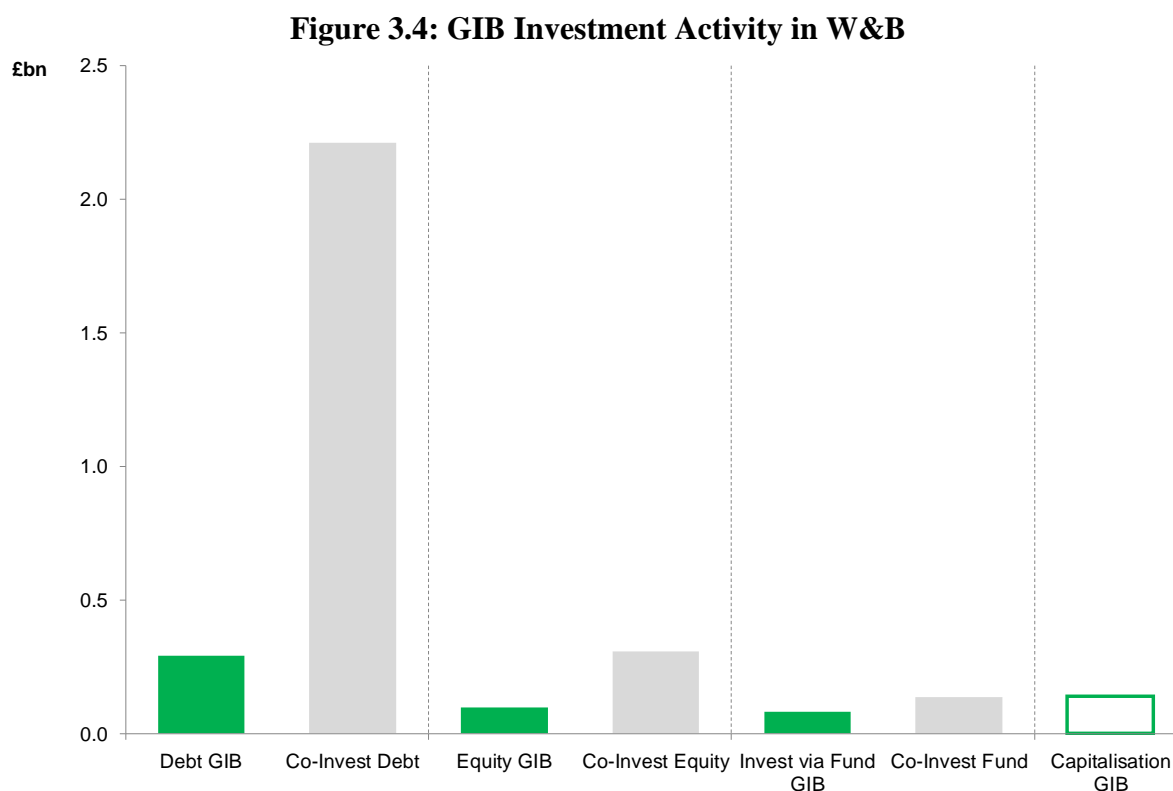
**Inadequate transaction structures and products:** There has been a shortage of aggregation vehicles to address the problem of limited project size and to offer investors a diversified portfolio of investment opportunities. This would also have taken the edge off investors' exposure limits regarding specific projects or developers (see the following paragraph).

**Lack of liquidity:** Three problems existed in this context: First, at the beginning of GIB's activity in the sector, there was a sudden drop in the supply of capital to PFI projects caused by the financial crisis and the abrupt change in government policy described above. Second, project developers sought longer term loans, which most lenders were reluctant to provide following the financial crisis and in light of changes in capital requirements. Third, while there were quite a few potential investors with at least some knowledge of the sector, these would often have hard limits on their exposure to a particular project or developer, which led to financing gaps at the level of individual projects.

As Figure 3.4 shows, GIB's investment in W&B has been both direct and via funds. GIB invested £293 million of debt alongside a total co-investment of £2.2 billion, giving a relatively high mobilisation rate of 7.5. GIB also invested £98 million of equity together with £308 million from private co-investors corresponding to a mobilisation rate of 3.1. Finally, fund managers invested £83 million on GIB's behalf alongside £138 million from other private investors (mainly other funds) implying a mobilisation rate of 1.7. This is out of a total capitalisation of funds of £140 million.

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<sup>31</sup> See, e.g., BusinessGreen, Waste-to-energy projects dealt blow as Defra slashes £200m in PFI support, 25 February 2013.



Source: NERA analysis of GIB data

Many of GIB's early W&B transactions were direct debt investments in municipal-waste PFI projects to fill the gaps in their long-term financing (e.g. Wakefield, Gloucester, West London, Merseyside). GIB has since continued to provide debt to municipal-waste projects. In these more recent cases, GIB's involvement was motivated by the technology risk associated with advanced gasification technologies (e.g. Derby, Levensat) or the lack of market liquidity (e.g. North Yorkshire), which is a potential issue with any large project.

A large part of the debt co-investment is accounted for by GIB's investment in the Drax biomass conversion project, for which GIB invested £50 million alongside a further £940 million of private sector and Infrastructure UK (a unit of HM Treasury) capital. This single transaction has a significant impact in boosting the overall sector mobilisation rate.

GIB has also invested extensively in projects drawing on non-municipal ("merchant") waste streams with a view to mitigating the relative immaturity of these markets. Several transactions saw GIB investing in energy-from-waste (EfW) plants fuelled by waste wood supplied by private contractors (for example, GIB invested in the Port Talbot, Evermore, Birmingham, Widnes and Tilbury plants) or commercial and industrial waste more generally (e.g. Hoddesdon). Some of these projects also exhibited technology risk associated with new gasification technologies (Birmingham, Hoddesdon). GIB's broader strategy regarding technology risk and market immaturity has been to accumulate expertise "in house" to enable it to assess the viability of investments that it hopes will have a positive demonstration effect to other market participants.

As regards regulatory risks, these were particularly acute in the Evermore project, which was beset by uncertainties pertaining to the RHI and ROCs in Northern Ireland. RHI risks were also relevant to Speyside, a combined heat and power plant in Scotland running on locally sourced biomass (GIB's only direct equity investment) and Widnes. GIB's efforts in all these cases were directed at understanding these risks and getting other investors comfortable.

GIB's strategy for dealing with insufficient aggregation of investment opportunities has been to set up specialised funds. In doing so, it relied on two external fund managers, Greensphere and Foresight. Initially, GIB committed £30 million to the Greensphere fund and £50 million to the Foresight fund (UKWREI fund). The main focus of the former has been on anaerobic digestion projects, which tend to be limited in size.<sup>32</sup> Similarly, the UKWREI fund has undertaken numerous equity investments in anaerobic digestion, but also invested equity in four merchant (Evermore, Birmingham, Widnes, Hoddesdon) and one municipal (Levensat) EfW projects. With the investment in UKWREI now fully deployed, GIB has recently committed a further £50 million to a new "Recycling and Waste" (RAW) fund, again managed by Foresight.

Table 3.4 summarises GIB's assessment of how its investments targeted the barriers to investment identified above. Further details on all of GIB's transactions in W&B can be found in Appendix A. Regarding "Lack of liquidity", it should be noted that tenor mismatch is a cross-cutting issue that all of GIB's debt investments have the potential to address by demonstrating the viability of longer tenors.

**Table 3.4: Barriers to Investment in W&B and GIB Investment Response**

Barrier Type	Manifestation	Main Investment Response
Technology risk	Waste gasification	Birmingham, Derby, Levensat, Hoddesdon
Regulation	Future of PFI model; subsidy regimes (RO, FIT, RHI)	<u>PFI</u> : Wakefield, Gloucester, West London, Merseyside; <u>subsidies</u> : Evermore, Speyside, Widnes
Diffuse & immature markets	Merchant waste projects	Port Talbot, Evermore, Birmingham, Widnes, Hoddesdon, Tilbury
Inadequate structures & products	Insufficient aggregation given size of projects and exposure limits of investors	Greensphere fund, Foresight funds (UKWREI and RAW)

<sup>32</sup> Greensphere has invested £19 million.

Lack of liquidity	Sudden drop in capital supply to Local Authority projects; exposure limits of investors; tenor mismatch	PFI: Wakefield, Gloucester, West London, Merseyside; <u>exposure</u> : e.g. North Yorkshire; <u>tenor</u> : potentially any GIB debt investment
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### 3.1.3. Non-domestic Energy efficiency

Non-domestic energy efficiency (NDEE) is a heterogeneous sector with diverse private- and public-sector project hosts (industrial facilities, hospitals, municipalities, etc.) and various technologies (biomass boilers, building insulation, on-site cogeneration, etc.). In a typical NDEE project, a relatively large capital expenditure upfront triggers cost savings over many years. Because of borrowing constraints imposed on their balance sheets, project hosts may find financing such projects on their own challenging. Aside from this, GIB identified the following barriers to investment facing the sector when it began operating in 2012:

**Technology risk:** There was little technology risk as enough mature technologies were available for deployment (“low-hanging fruit”), an example being LED technology for energy-efficient lighting solutions.

**Regulation:** The regulation barrier is also considered to have been low because private investors earning a satisfactory return on their investments would be largely independent of public subsidies (such as ROCs or CfDs, a possible exception being the RHI for certain technologies).

**Diffuse and immature markets:** While the technologies in NDEE tended to be mature, they are often deployed in small projects that fall below the minimum “ticket size” required by most investors. Also, many hosts of potential NDEE projects are public-sector entities such as local authorities or NHS Trusts. Market development in these cases is hindered by their limited awareness of, or experience with, private financing solutions as well as regulatory constraints. Investors would also be put off by relatively time-consuming procurement and decision making procedures that they are not familiar with.

**Inadequate transaction structures and products:** The aforementioned fragmentation of the sector into small projects could have been overcome with the help of aggregation vehicles, but such structures did not exist before GIB became involved. As mentioned above, for the funding of individual projects, the only available option would often be on-balance sheet financing by project hosts, a route that many project hosts were unable or unwilling to take because of relatively long payback periods, relative to other strategic investments (for example, combined heat and power or district heating projects can have payback periods in excess of ten years).

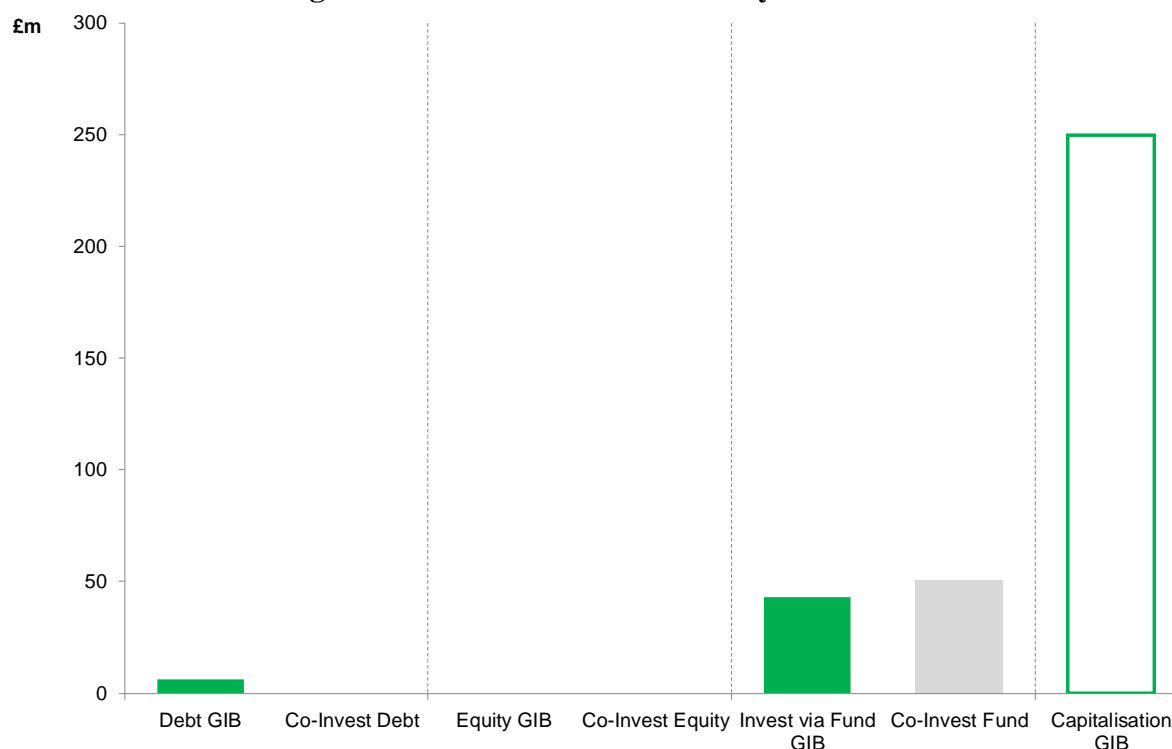
**Lack of liquidity:** The main barrier in this context, which applied to debt financing, was “tenor mismatch” meaning that private investors were only willing to lend to NDEE projects for significantly shorter than the expected asset life. This makes it difficult to achieve real net savings for a number of years after the investment is made. A second potential issue is investors’ exposure limits to particular segments of the market.

As shown in Figure 3.5, GIB’s investment in NDEE has been both direct and via funds. The direct channel is limited to a single debt investment of £6 million without any co-investment



(the loan to Glasgow City Council discussed below). Fund managers invested £43 million of GIB capital with a co-investment of £51 million, implying a mobilisation rate of 1.2, out of a total capitalisation by GIB of £250 million.

**Figure 3.5: GIB Investment Activity in NDEE**



Source: NERA analysis of GIB data

As is apparent from Figure 3.5, funds play a dominant role in NDEE, their main purpose being to address limited project scale and lack of aggregation. GIB backed three new NDEE funds, in all of which it became the cornerstone investor and the management of which it delegated to professional fund managers. Two such companies, Equitix and SDCL, were chosen in 2012 via a competitive tendering procedure. The third fund, whose purpose has been to provide debt specifically to public-sector projects, is managed by Aviva Investors. For any project in which these funds invest, GIB requires a co-investment from another fund or other private investor that at least matches GIB's investment. To each fund, GIB initially committed £50 million. In deploying this capital, Equitix, with its focus on boiler replacement programmes covering, *inter alia*, schools, social housing projects, distilleries and poultry farms has been most successful, to the extent that GIB extended the Equitix fund by an additional £50 million in late 2014. As for the fund managed by SDCL, its focus has been on retrofits of hospitals and industrial facilities as well as energy-efficient lighting solutions for the private sector, investing a total of almost £11 million to date. The Aviva fund has deployed the least capital to date. It has invested £1.2 million so far in a single hospital project (installation of a combined heat and power unit).

In addition to these three funds, GIB also forged two funding alliances for providing loans to NDEE projects mainly in the NHS, with Societe Generale Equipment Finance and the Dutch asset financing company De Lage Landen (a subsidiary of Rabobank).<sup>33</sup> GIB has committed £25 million to each of these, which is matched by similar-sized commitments from GIB's partners. The main purpose of these alliances is to aggregate investment opportunities and improve risk sharing to mitigate liquidity shortfalls caused by the exposure limits faced by investors and project developers. Since both alliances have features similar to funds, we've counted GIB's commitments to them as "capitalisations".

At the level of individual projects, to address borrowing constraints faced by project hosts, GIB has promoted the "pay as you save" model. This means that the loan for financing an NDEE investment is structured in such a way that all debt service (interest payments and repayment of principal) is financed out of savings on the host's energy bill.<sup>34</sup>

Finally, to tackle barriers to investment in public-sector projects, GIB developed a loan product for local authorities to finance the installation of energy-efficient street lighting (also featuring "pay-as-you-save"). As a first implementation, GIB provided a £6.3m loan to Glasgow City Council in late 2014. So far, this has been GIB's only direct NDEE investment.

Table 3.5 summarises the preceding paragraphs. Further details on all of GIB's transactions in NDEE can be found in Appendix A. Regarding the "Lack of liquidity" barrier, it should again be noted that tenor mismatch is a cross-cutting issue that all of GIB's debt investments have the potential of addressing by demonstrating the viability of longer tenors.

**Table 3.5: Barriers to Investment in NDEE and GIB Investment Response**

Barrier Type	Manifestation	Main Investment Response
Technology risk	Limited barrier because of availability of mature technologies (e.g. LED lighting)	N/A
Regulation	Limited barrier as profitability of most projects not contingent on subsidies	N/A
Diffuse & immature markets	Small-scale projects; public-sector projects	<u>Scale</u> : Funds managed by Equitix, SDCL and Aviva; funding alliances with SGEF and DLL; <u>public sector</u> : Green Loan for local authorities

<sup>33</sup> The alliance with DLL is intended to focus exclusively on the NHS, while that with SGEF is broader in scope. So far, both alliances have only been active in the NHS.

<sup>34</sup> This is in contrast with the Public Works Loan Board, for example, which does not allow the (public-sector) recipients of its funding to capitalise interest payments during construction or shape the loan repayments to forecast energy savings.

Inadequate structures & products	Insufficient aggregation given limited project size; lack of alternatives for project hosts to on-balance sheet financing	<u>Aggregation</u> : funds and funding alliances; <u>project hosts</u> : “pay-as-you-save” model
Lack of liquidity	Tenor mismatch; exposure limits to different market segments	<u>Tenor</u> : potentially any GIB debt investment; <u>exposure</u> : funding alliances

### 3.1.4. Small-scale renewables

Small-scale renewables (SS RES) projects are, by definition, limited in scale and therefore tend to be too small for most institutional investors. The sector was initially outside GIB’s remit. In 2014, GIB identified a potential gap in the supply of capital to the sector following the withdrawal of the Co-operative Bank and changes to the tax treatment of Venture Capital Trusts and Enterprise Investment Schemes (both of which had been important vehicles for capital deployment into the sector). The UK Government’s application to extend GIB’s activities to SS RES was approved by the European Commission in May 2014. Given that GIB has only very recently become active in SS RES, we do not treat it at the same level of detail as GIB’s other sectors.

**Figure 3.6: GIB Investment Activity in SS RES**



Source: NERA analysis of GIB data

GIB’s approach in SS RES to date has been to invest in two fund-like structures. The first, Temporis, is a £200 million lending programme, to which GIB has committed £100 million. The second is a £100 million investment vehicle managed by Albion Community Power,

whose goal is to make unlevered equity investments in projects. Again, GIB has contributed half of the total investment, namely, £50 million. As shown in Figure 3.6, by May 2015, just £10 million of these capitalisations had been deployed to projects.

## 4. Assessing the Past and Future Role of GIB

### 4.1. Assessment methodology

We have drawn on a number of different sources, including investors, project developers and owners, market advisors and government officials both to help us evaluate GIB's impact to date and to offer views on GIB's future role in the green economy.<sup>35</sup> In order to obtain input from a wide cross-section of stakeholders we designed and implemented a survey to assist in our assessment of GIB. We also carried out a number of follow-up interviews across each of GIB's main sectors of activity to investigate specific topics in more detail – both with those that had completed the survey and others who had not.

The barriers to private investment act as a common theme throughout our evaluation, allowing us to assess whether GIB's actions have successfully addressed the market failures in the offshore wind, waste & bioenergy, non-domestic energy efficiency and, more recently, small-scale renewables sectors. We maintained this focus on barriers when looking into how and where GIB might deploy its capital over the next 5 to 10 years. A key objective throughout our data gathering efforts was to determine the extent to which the presence of GIB in a particular sector, or even at the transaction level, allowed more private capital to flow into the sector and, in doing so, whether it addressed the main barriers to investment.

### 4.2. Survey design and implementation

One of our main sources of evidence on GIB's record to date as well as its future role was via an online survey that we circulated to stakeholders who are active, to some degree, in different aspects of the green economy.

The following bullet points summarise the main areas and types of information that we asked for in the survey. The results from our analysis of the survey data are included in Chapter 5 and Chapter 6 below, covering GIB's impact to date and an assessment of its future role, respectively.

- **Details of the respondent** – we asked for information to allow us to categorise respondents, including type of involvement in the sector (investor, advisor, policy maker, etc.) interactions with GIB, as well as more detailed information for investors such as their sectoral focus, typical investment sizes and whether their focus was on the debt or equity side.<sup>36</sup>
- **Familiarity with different sectors** – we asked all respondents which of GIB's four “core” sectors they were familiar with, or if they were unfamiliar with any of them. We only presented questions about GIB's impact and its future role in each of these sectors to respondents who were familiar with a particular sector.

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<sup>35</sup> We have also reviewed various internal (confidential) documents that GIB has shared with us including findings from surveys of market investors that it has commissioned over the last two years.

<sup>36</sup> All survey responses (and follow-up interviews) were provided on a confidential basis. NERA has not shared details of respondents with either GIB or BIS, or any other parties, and all of the results presented are based on aggregated data to ensure respondent anonymity.

- **Project-specific questions** – we asked respondents to state which of the projects or transactions that GIB has been involved in they were familiar with. For each project or transaction that they were familiar with we then asked specific questions regarding the innovativeness of the transaction and of the commercial and business model used, and we asked them to express a view on what might have happened with the project or transaction if GIB had not become involved.
- **Sector specific questions (historic)** – we asked respondents to rank the barriers to investment in each sector at the time GIB was established in 2012 and assess how successful GIB had been at addressing these different barriers.
- **Sector specific questions (future)** – we then asked respondents to rank the barriers to investment in each sector over the next 5 years and assess the extent to which GIB might address these different barriers.
- **Other sectors and the need for GIB intervention** – we asked respondents to state whether there was a need for GIB intervention in a number of other sectors, outside of GIB’s current focus areas (these sectors are listed in section 6.2.1 below), and asked them about the main barriers to investment in each of these sectors.
- **GIB’s product offering in the future** – we finally asked respondents to assess the likely impact of different future product offerings on crowding in private capital to the green economy.

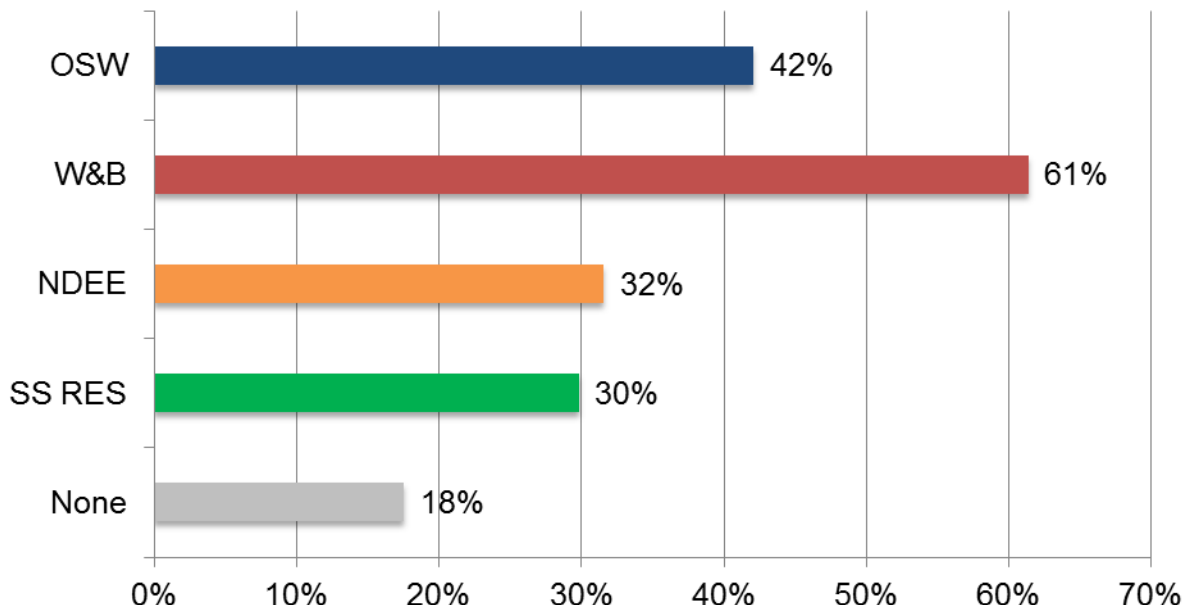
In collaboration with both GIB and BIS, and other government departments, we developed a list of relevant stakeholders from across GIB’s existing core sectors as well as other potential sectors where GIB may play a role in the future. The survey was sent to over 200 individuals, including:

- Investors (both debt and equity providers) active in waste and energy markets;
- Project developers;
- Project owners;
- Market advisors;
- Government staff (including representatives from DECC, BIS, Defra, DfT and HMT); and
- Non-Governmental Organisations (NGOs) and Non-Departmental Public Bodies (NDPBs).

Our intention was to seek views from across these different types of stakeholder with an emphasis on investors and project developers, given their more frequent interactions with GIB. We received 57 completed responses to our survey, giving a response rate of approximately 30 per cent. Although this is a relatively small number of responses, it reflects responses from across a wide spectrum of relevant respondent types and across the sectors they were familiar with (as shown in Figure 4.2 and Figure 4.1 below, respectively). We therefore are satisfied that we received views from a representative group of different market participants and that our findings are informative.

Figure 4.1 shows, for each of GIB’s core sectors, the percentage of respondents that were familiar with the sector. Respondents were only shown questions relating to the sectors that they declared themselves familiar with.

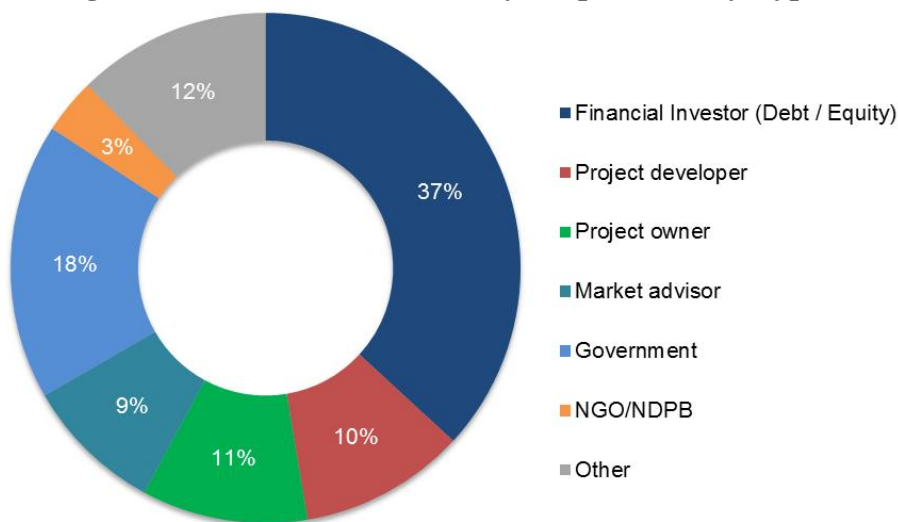
**Figure 4.1: Familiarity of Respondents with GIB’s Sectors of Activity**



Source: NERA survey

The distribution of respondents by type is shown in Figure 4.2. Debt or equity investors made up the single largest category, accounting for almost 40 per cent of the response sample. A further 20 per cent of the respondents were either project owners, or developers. Government staff provided almost another 20 percent of the responses. The remainder was made up of market advisors, non-governmental organisations (NGOs) or non-departmental public bodies (NDPBs) and “others”, which were mostly representatives from industry or trade associations.

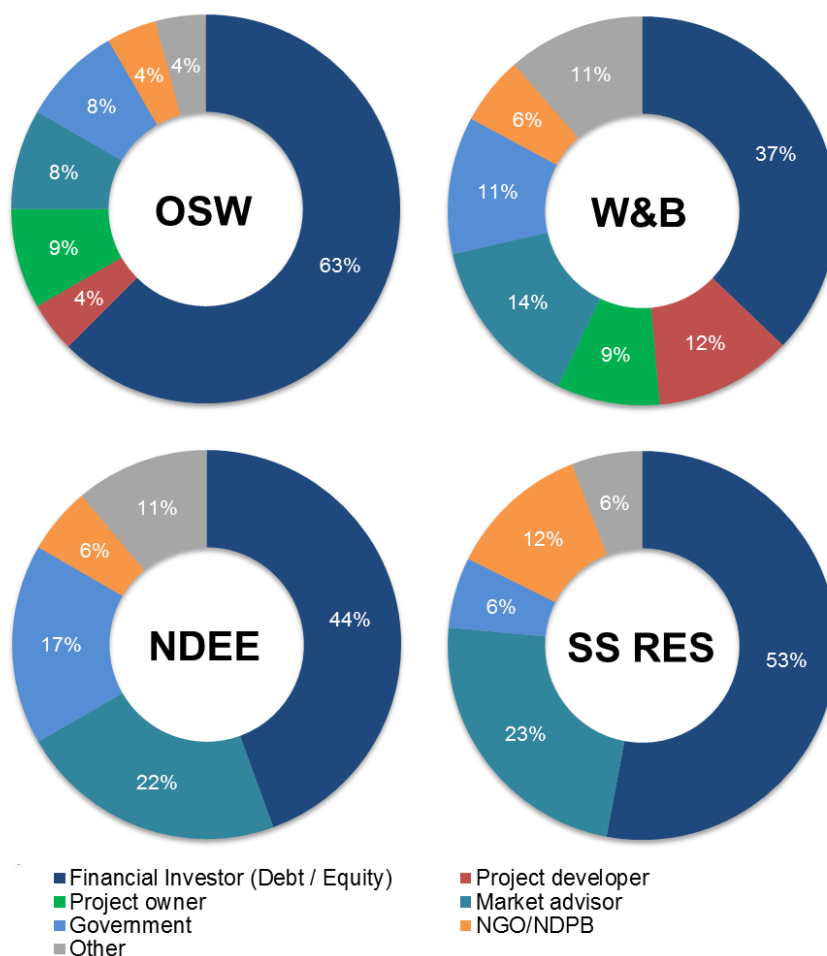
**Figure 4.2: Distribution of Survey Respondents by Type**



Source: NERA survey

Figure 4.3 provides a more detailed breakdown of the survey respondents, amongst those that indicated they were familiar with each of the 4 core sectors.

**Figure 4.3**  
**Distribution of Survey Respondent Types by Sector**



Source: NERA survey

These sector-specific samples again show that we received responses from a variety of different interests and involvement in the individual sectors. In all cases investors make up the largest share of respondents, most noticeably for offshore wind. We did not receive any responses from self-identified project owners or developers active in either the non-domestic energy efficiency or small-scale renewables sectors, but the debt/equity investor category was still the largest segment for both of these. As shown above in Figure 4.1 some of the respondents in the full sample did not indicate familiarity with any of GIB’s current core sectors. These respondents only answered questions about the need for GIB intervention in other sectors of the green economy and in relation to GIB’s future product offering.

### 4.3. Follow-up interviews

To supplement our survey results and probe certain issues in more depth we carried out a number of follow-up interviews – most of them with those who had completed the online survey. The interviews generally explored issues similar to the survey itself, although with greater focus on either specific points that were made in the survey or particular areas of interest that had become apparent during our preliminary discussions with GIB staff and throughout the course of the evidence gathering process.



We held over 20 interviews with stakeholders active in GIB's core sectors and the wider green economy. As per our survey, investors (both debt and equity) made up the largest share of those that we followed-up with in more detail. We also spoke to representatives from a number of government departments with an interest in GIB (including the Department for Energy and Climate Change, the Department for the Environment, Food and Rural Affairs, the Department for Business Innovation and Skills, the Department for Transport and HM Treasury) as well as NDPBs, market advisors and project developers.

As per the survey, all of our interviews were carried out in confidence and the findings and key messages that we present in this report are all anonymised and based on our analysis of all of the responses in the aggregate.

## 5. The Impact of GIB to Date

This chapter presents our findings about the impact that GIB has had on the four sectors in which it has been active to date. For each sector, we first present a summary of our survey results. This is followed by a detailed appraisal of GIB's impact, in which we also draw on any survey commentary that we have received as well as the insights obtained from the follow-up interviews. In order to protect the confidential information received from respondents, we do not distinguish in our discussion between the comments made by survey respondents and the opinions expressed in the follow-up interviews. In general, we refer to individuals in either group as "respondents" or "market participants".

For each sector, the summary of the survey results covers three sets of questions:

- How significant were the barriers to investment (defined in section 2.1 above) before GIB became active in the sector? And how successful has GIB been in addressing each of these barriers?
- Regarding each project that GIB has invested in, how likely would have been each of the following outcomes supposing that GIB had been absent from the sector:
  - Project or transaction would have been largely unchanged;
  - Project or transaction would have been subject to delays;
  - Project or transaction would have been delivered at a higher cost of capital;
  - Project or transaction would have been reduced in scale;
  - Project or transaction would not have happened.
- How large an impact has GIB had on technological, commercial and financial innovation in the sector? And how large has its impact been on improving regulation?

In principle, the responses to the second set of questions lend themselves to quantifying GIB's impact on each sector by calculating the capital shortfall without GIB (relative to actual investment) based on what respondents believe would have happened to projects (and hence the capital invested in them) in the absence of GIB. However, we have refrained from doing so for two main reasons: First, doing so requires making various untested assumptions, for example, about what exact capital shortfall respondents had in mind when they selected "subject to delays" or "reduced in scale" as the most likely outcome for a particular project. Second, sample sizes in some sectors were too small to derive robust numerical conclusions (which the discussion in the following sections makes clear).

Similarly, our survey results indicate that GIB has had an impact, across its core sectors, in reducing the cost of capital of the projects in which it has intervened. The responses we received, however, do not allow us to make any robust conclusions about how much GIB's participation has affected the cost of capital in terms of a change in basis points. A key difficulty in quantifying a cost of capital impact is the lack of a clear counterfactual case against which it can be measured. The cost of capital is influenced by a number of factors, including the regulatory environment, the particular features and risks of an individual project,

the other project participants and the exact structure of the deal.<sup>37</sup> Such an analysis would require detailed information on all of these factors, as well as on the pricing terms that were agreed for the transaction, for both projects that have, and have not, benefitted from GIB's intervention. Much of this data is highly confidential and we have therefore not been able to quantify a cost of capital impact as part of this study.

## **5.1. The Impact of GIB on OSW**

### **5.1.1. Survey evidence on GIB's impact**

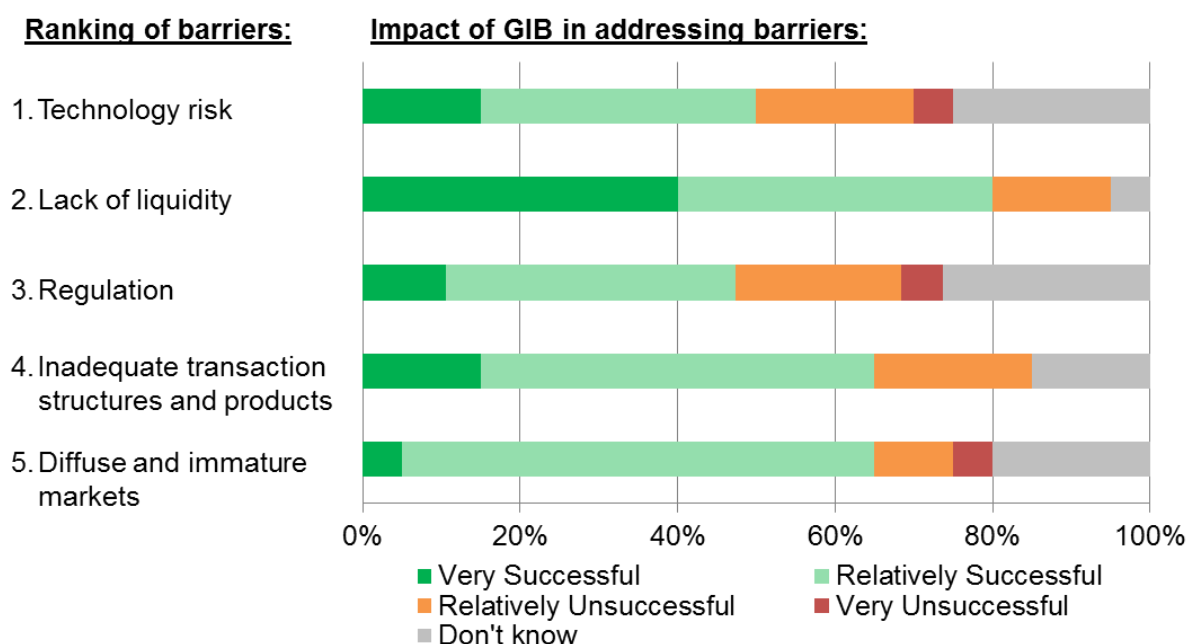
A total of 20 respondents shared their views on GIB's impact in the OSW sector. We believe the responses provide a good sampling of market views about the sector and about GIB's role in it, although it is very difficult to know whether the results are truly representative of market views, given the relatively small size of the sample.

As set out above, the first set of questions asked about the barriers to investment that existed prior to GIB becoming active in the sector. Figure 5.1 shows respondents' ranking of barriers together with their assessment of the success that GIB has had in addressing them. The barriers are presented on the left hand side in the order of their importance in preventing private investment into the sector in 2012. The bars then indicate the share of respondents who thought GIB had been "very successful", "relatively successful", "relatively unsuccessful" or "very unsuccessful" in addressing each of these barriers, or those that did not know. The more successful GIB has been at addressing the higher ranked barriers, the more likely it has been effective in achieving its objective of reducing the barriers to investment and attracting private capital to the sector.

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<sup>37</sup> See, for example, NERA, Changes in Hurdle Rates for Low Carbon Generation Technologies due to the Shift from the UK Renewables Obligation to a Contracts for Difference Regime, Report prepared for DECC, 9 December 2013, which sets out a number of the key risks that impact on the cost of capital for renewable generation projects.

**Figure 5.1: Ranking of Barriers to Investment in OSW before GIB Became Active in the Market and GIB’s Success in Addressing These Barriers (20 responses)**



Source: NERA survey

According to the survey results, technology risk was the most significant barrier to investment in offshore wind, followed by lack of liquidity and regulation. GIB was judged to have been most successful in addressing the lack of liquidity barrier (with 40 percent of respondents considering it to have been very successful, and 80 percent at least relatively successful). Tackling insufficient liquidity therefore emerges as a main achievement of GIB in OSW over its first two years.

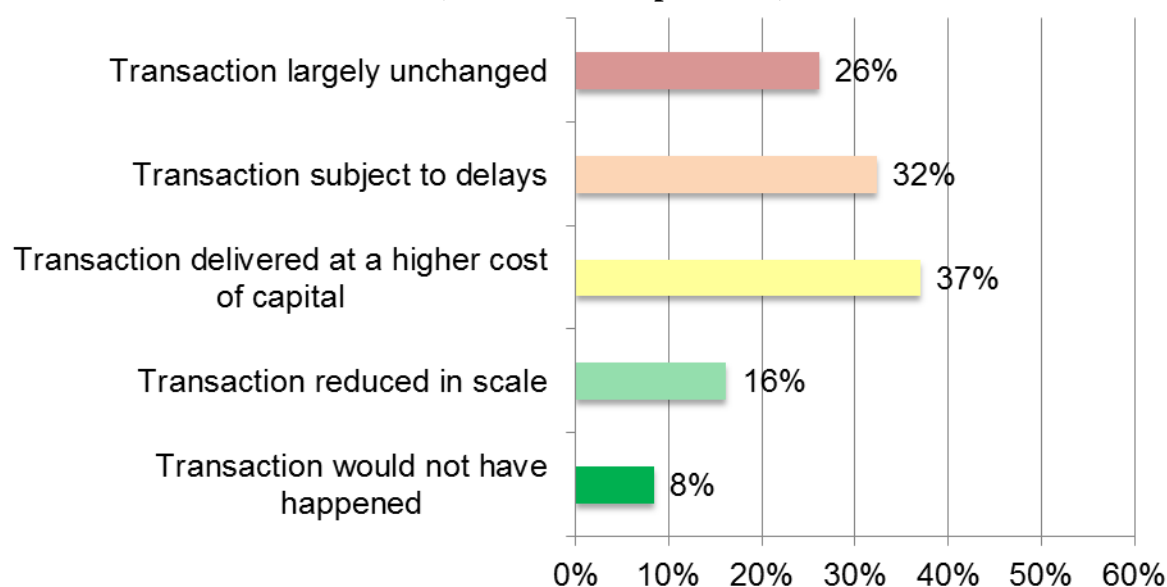
As discussed above, a second set of questions concerned respondents’ views about what would have happened to projects if GIB had been absent from the sector. For OSW, because GIB has not taken any development risk in OSW, we focused not on *project* outcomes, but instead on *transactions*. For example, we sought views on whether the sale of an equity stake in an operational wind farm like Sheringham Shoal would have happened without GIB – and if so, whether the terms of the transaction would have been any different.

For each OSW transaction, each respondent was asked to state which counterfactual outcome or outcomes they believed would have materialised if GIB had not been active in the sector (out of the five outcomes defined above, namely, “transaction unchanged”, “delayed”, “at higher cost of capital”, “reduced in scale” and “not have happened”). Averaging across all responses for a given transaction yields the “likelihood” of these different outcomes for the transaction.<sup>38</sup> For example, if there were five respondents who each selected a different counterfactual outcome for a given transaction, then this would suggest there was a 1 in 5 (or

<sup>38</sup> We treated the response that outcome *x* would have been most likely to materialise as saying that it would have happened with a probability of 100 percent.

20 per cent) chance of each counterfactual outcome materialising without GIB.<sup>39</sup> After calculating likelihoods for each transaction, we calculated likelihoods for the sector as a whole by averaging likelihoods across all transactions and weighting by transaction size. This means that the likelihoods for larger transactions have a greater influence on the result for the sector. The results for OSW are shown in Figure 5.2.<sup>40</sup>

**Figure 5.2: Average Likelihood of Counterfactual Outcomes in OSW Without GIB (based on 15 respondents)**



Source: NERA survey

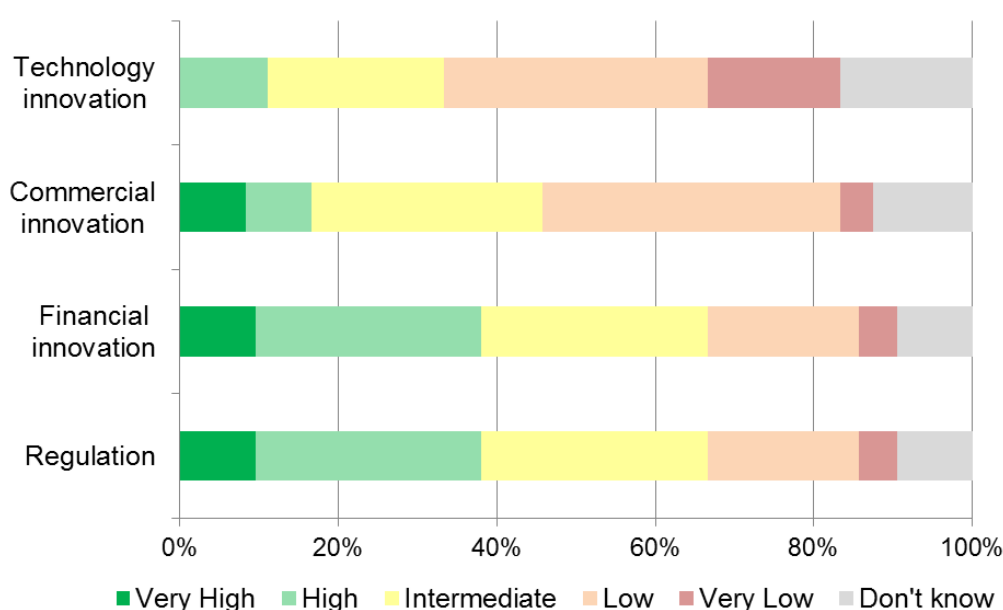
Respondents suggested that the most likely outcome without GIB is that the cost of capital would have been higher (with a likelihood of 37 percent). This is partly driven by respondents' views about the transactions where GIB refinanced equity stakes through debt (Walney and London Array). It appears that respondents believed that GIB's presence in these transaction provided comfort to co-lenders, encouraging them to invest and, potentially, lowering their return requirements. Responses for GIB's equity investment in Sheringham Shoal also indicated that GIB's presence helped lower the cost of capital. As GIB invested on its own in this transaction, this suggests that respondents may believe that GIB paid too high a price, although respondents are not likely to know the specifics of the transaction in detail. The second most likely counterfactual outcome was delay (with a likelihood of 32 percent), suggesting that GIB was able to accelerate projects. On average, only a relatively small proportion of responses (8 percent) suggested that transactions would not have gone ahead *at all* without GIB. And a significant proportion of responses (26 percent) felt that certain of GIB's offshore wind transactions would have gone ahead unchanged, even if GIB had not been involved.

<sup>39</sup> It is important to note that these likelihoods need not sum to 100 per cent (unlike in the example) because the outcomes are not mutually exclusive. For example, some respondents indicated that a transaction would have been both delayed and reduced in scale.

<sup>40</sup> We do not report here how different events (e.g., delays and higher costs) are correlated in the view of respondents. The figure only shows the probability of each counterfactual independent of the others.

Figure 5.3 summarises the respondents’ assessment of GIB’s influence on innovation (in terms of technology, commercial, and financial models) and regulation in OSW. In this context the impact on regulation may refer to both GIB’s role in helping co-investors understand and become more comfortable with the risks associated with the UK regulatory regime as well as its interactions with policy makers in offering advice on how policy should be developed or amended to best attract investors. Information regarding the latter influence is likely to be less well known, however, so we anticipate that the majority of responses to this question were made in relation to GIB’s ability to provide comfort about existing regulations.

**Figure 5.3: GIB’s Impact on Innovation and on Improving Regulation and Policy Making in OSW (21 responses)**



Source: NERA survey

Perhaps unsurprisingly, GIB is credited with the largest impact when it comes to financial innovation. The perceived impact of GIB on improving regulation is similar. GIB was perceived to have contributed less to innovation in commercial / business models (less than 50 percent finding an intermediate or better impact) and technology (around one third).

### 5.1.2. Appraisal of GIB’s Impact

In light of this survey evidence, supplemented by what has emerged from the survey comments and follow-up interviews as well as our review of non-public analyses that GIB has provided to us for this study, the most significant impacts of GIB on OSW to date are:

#### 5.1.2.1. Improving market liquidity

Market liquidity has been and continues to be vital to the development of the OSW sector. Liquidity encourages new investment because utility developers and early-stage investors can be confident of there being a “way out” for their capital (for example, after construction has been completed). Also, in a liquid market, it is possible for investors and project developers

to “recycle” capital, i.e., to find a buyer for their investments and reinvest the proceeds in the development and construction of new assets.

As indicated by our survey results and confirmed by market participants in the survey comments and follow-up interviews, market liquidity in OSW was limited when GIB was set up (in the aftermath of the financial crisis) and many respondents credit GIB with helping to tackle liquidity constraints. GIB’s contributions to liquidity were driven by several factors: First, the additional capital that GIB supplied to the market had a positive impact on its own by bolstering the supply side of the market. As discussed in the previous section, our survey results suggest that GIB’s involvement in transactions has provided comfort to other investors, which is likely to have provided an additional stimulus to capital supply. Market participants have confirmed that GIB has become one of the key investors in the sector and is seen as a reassuring partner in transactions primarily because its presence implies government “skin in the game”. Some suggested, however, that the reassurance that GIB provided could have a downside, because they were aware of cases where an investor had been hesitant about participating in a particular transaction because GIB was *not* involved in that transaction. Market participants also noted the beneficial impact of GIB accelerating transactions. Survey respondents’ views about what would have happened to transactions without GIB support a similar conclusion.

GIB also enhanced liquidity by offering new refinancing models (as is already suggested to some extent by the survey results on GIB’s impact on financial innovation). For example, the Walney transaction featured one of the first non-recourse debt refinancing of a minority stake in an OSW asset.<sup>41</sup> In the Westermost Rough transaction, a holding company owned by GIB and a co-investor bought a minority stake in an OSW asset that was commencing the offshore construction. GIB and the co-investor then succeeded in having this stake refinanced by a consortium of banks before the completion of construction. These transactions contributed to the liquidity of refinancing markets and are likely to have had a positive demonstration effect on early-stage investors, in particular those considering taking minority stakes in OSW farms. In a broader sense, the purchase by GIB of equity stakes in operational assets (Rhyl Flats, Sheringham Shoal) also contributed to the liquidity of refinancing markets.

However, despite our survey responses and interviews generally indicating that there was somewhat of a need for capital amongst operational projects when GIB was set up, there were some market participants that voiced doubts about the additionality of GIB in these transactions, as some of the counterparties were state-backed utilities (DONG, Statkraft, Statoil), who they considered not to be short of capital to deploy into OSW. Similarly, some of our respondents questioned whether certain liquidity-enhancing transactions that *in theory* may have allowed project sponsors to recycle capital into the sector could really be said to have promoted additional *new* investment in offshore wind. To promote capital recycling, GIB obtained assurances from the vendors that they would reinvest the proceeds from the sale to GIB in new UK OSW projects. Some market participants have voiced doubts on

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<sup>41</sup> A similar model had previously been used in the Gunfleet Sands transaction, in which GIB was not involved, however; such a model was also used later by GIB in the London Array and Westermost Rough refinancing transactions.

whether this was likely to happen. GIB believes these transactions were followed by additional investments.<sup>42</sup>

#### 5.1.2.2. Taking on construction and technology risk

GIB also contributed to the advancement of the sector by filling capital gaps in transactions involving construction risk (Westermost Rough, Rampion). In the case of Westermost Rough, GIB also took on technology risk. However, some market participants voiced their dissatisfaction about GIB not having made more investments involving construction risk, which was described as an area in which the additionality of GIB to the market was particularly salient, and of coming relatively late to such investments in the context of the wider market for European offshore wind projects.<sup>43</sup> According to these observers, the relatively cautious approach of GIB has at times made it indistinguishable from the other banks operating in the sector (its exclusive focus on the green economy notwithstanding).<sup>44</sup> A smaller number of respondents took the opposite view, however – that is, that GIB had underpriced the risks associated with offshore wind investments and therefore been willing to pay above market prices for such assets. The evidence for this view seems limited, however, and more respondents felt that GIB had been too conservative, rather than too liberal, in its deployment of capital in the sector.

#### 5.1.2.3. Creating a product for institutional investors

A third impact of GIB consists in GIB having built a portfolio of minority interests in operational wind farms (Rhyl Flats, Sheringham Shoal) and transferring these to its newly created UK Offshore Wind Fund.<sup>45</sup> This was intended to cater to the needs of institutional investors in search of predictable yields over a long time horizon, who had not invested in OSW previously. To date, the fund has achieved its “first close”, but is still seeking to attract additional investors, and it remains to be seen how quickly this will be done, and whether the model will be replicated for UK offshore wind by other fund / portfolio managers (as it has been for other renewable funds and yieldcos in the UK and elsewhere).

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<sup>42</sup> Project developers that we have talked to have noted that in practice it is not straightforward to trace the exact destination of this capital and highlighted that future investments are ultimately assessed on the individual merits relative to other opportunities without, for example, a dedicated pot set aside for UK offshore wind projects. However, the developers appear to have taken some comfort from the fact that they have been able to sell their operational assets, providing greater confidence that there will be liquidity in the market once they complete subsequent projects.

<sup>43</sup> For example, the Butendiek OSW project in Germany reached financial close prior to GIB’s investment in Westermost Rough in March 2014, and the Gemini and Westermeerwind projects in the Netherlands closed shortly after Westermost Rough. All three continental European OSW projects involved financing with some element of construction risk, although the policy regimes and market exposure differed materially from those in the UK, and therefore are not directly comparable.

<sup>44</sup> As mentioned above, GIB has very recently completed its second transaction involving construction risk, namely, the Rampion deal.

<sup>45</sup> GIB also recently purchased a minority stake in the late-construction stage Gwynt y Mor wind farm, conditional on construction being completed, and is expected to transfer it to its offshore wind fund once the latter is operational.



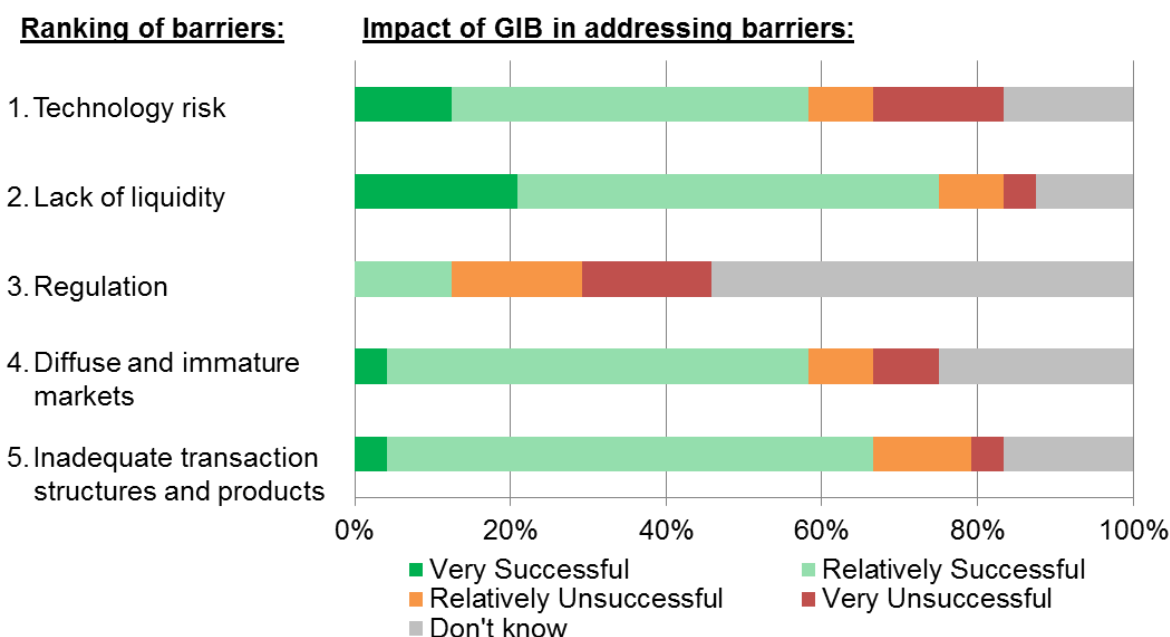
## 5.2. The Impact of GIB on W&B

### 5.2.1. Survey evidence on GIB’s impact

In our survey we asked all respondents who stated they were familiar with the W&B sector the same questions as described above for OSW (as we did for NDEE and SS RES, which are presented below). In total there were 35 respondents who said they were familiar with the sector. As for the OSW sector, the number of responses gives us confidence that the findings of the survey should identify key themes and concerns of sector participants, but the level of confidence we have in any particular number emerging from the results is only moderate, given the relatively small sample size.

Figure 5.4 shows, on the left hand side, the ranking of barriers to investment in the W&B sector when GIB entered the market in 2012 based on a sample of 24 respondents. The bars show how successful respondents assessed GIB to be in addressing each of these barriers.

**Figure 5.4: Ranking of Barriers to Investment in W&B before GIB Became Active in the Market and GIB’s Success in Addressing These Barriers (24 responses)**



Source: NERA survey

The ranking of barriers is the same as for OSW, with the exception of the last two: for W&B diffuse and immature markets is ranked above inadequate transaction structures and products. Technology risk and the lack of liquidity are the two main barriers. These were also the barriers that the highest proportion of respondents thought GIB had been “very successful” at addressing. Overall GIB appears to have had most success at addressing the barriers to liquidity (with three quarters of respondents giving a positive assessment of GIB’s success in addressing these barriers).

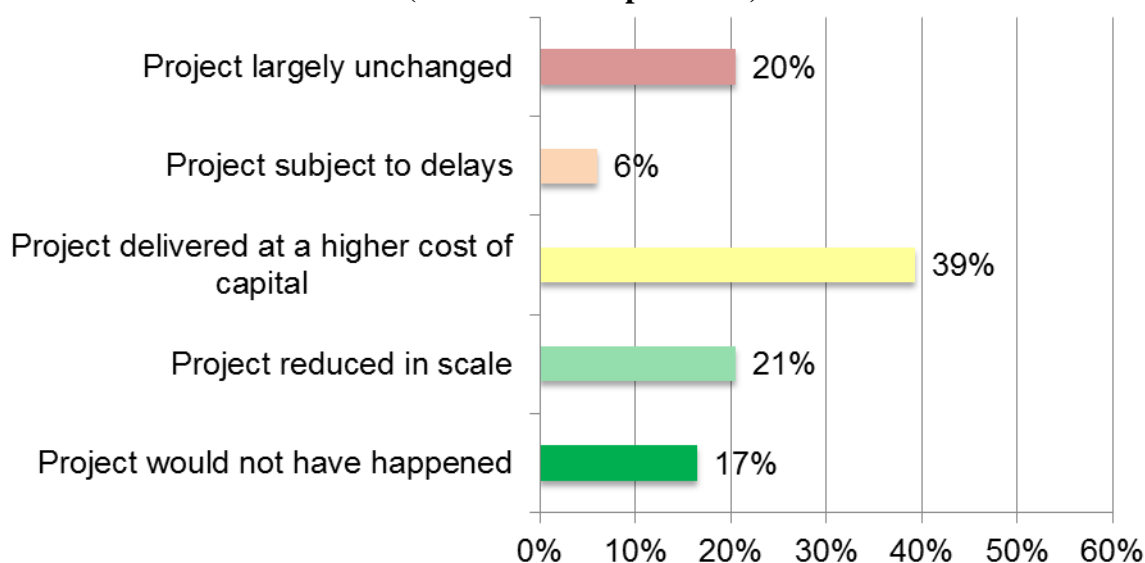
Nearly 60 percent judged GIB to have had some success in addressing technology risk, although it is also notable that nearly 20 per cent thought GIB had been very unsuccessful at addressing technology risk – more than the proportion that thought the Bank had been “very

successful”. With some important exceptions the majority of projects in this sector that GIB invested in tended to be at the mature end of the technology spectrum, with some respondents expressing the view that GIB should have been more active at helping develop less proven waste technologies. This may explain the rating.

Regulatory barriers were among the top three facing the W&B sector, but the smallest proportion (slightly over 10 percent) of respondents thought GIB had been successful at addressing these, and the largest proportion (around one-third) thought GIB had been unsuccessful. An important caveat to this finding is that more than half of respondents did not know enough about GIB’s impact to offer an assessment, presumably because GIB’s discussions with government will tend to be, by their nature, confidential and undisclosed to other market participants.

Figure 5.5 presents the results of our questions about what respondents believed would have happened to the various projects supported by GIB and its funds if GIB had not become involved with them.

**Figure 5.5: Average Likelihood of Counterfactual Outcomes in W&B Without GIB (based on 16 respondents)**



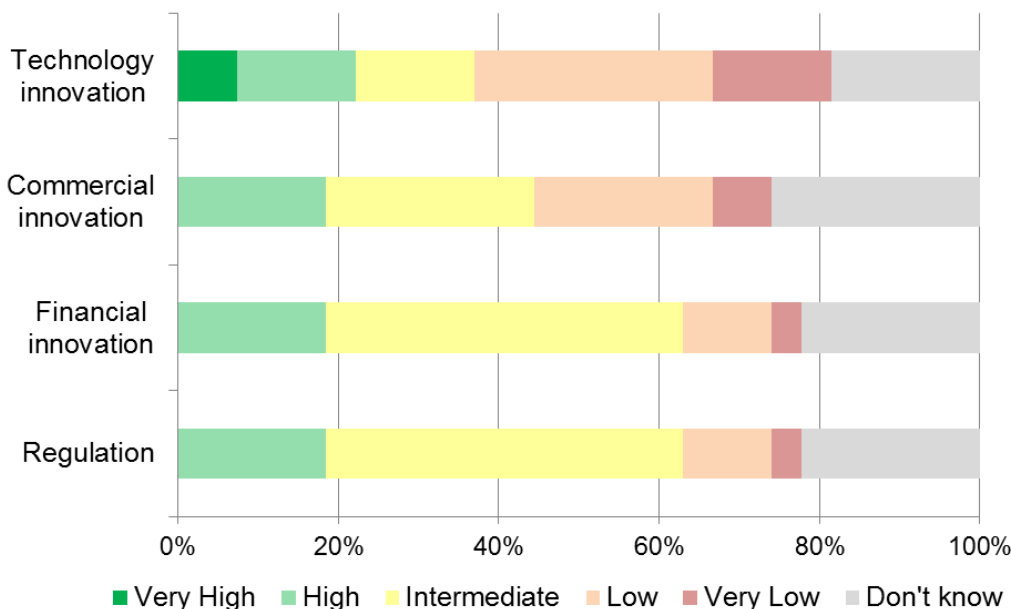
Source: NERA survey

For W&B a higher proportion of responses than for OSW considered GIB’s participation in the project to have been indispensable to it going ahead at all: the average likelihood of a project not having gone ahead at all was 17 per cent, which is more than double what we found across the OSW transactions. Similar to OSW, respondents felt that the most common outcome without GIB involvement would have been that projects would have been delivered at a higher cost of capital, with respondents indicating that this would have been the case in just under 40 per cent of projects. In contrast to OSW, very few respondents believed that GIB materially reduced delays for W&B projects, whereas this benefit was the second most commonly cited for the OSW sector.

On average one-fifth of responses were that GIB’s involvement had no impact on the project, suggesting that a significant proportion of the market believed that at least in some cases, GIB’s participation was not always necessary for projects to have gone ahead.

The survey respondents’ assessment of GIB’s impact on innovation (in terms of technology, commercial and financial models) as well as its impact on regulation is set out in Figure 5.6.

**Figure 5.6: GIB’s Impact on Innovation and on Improving Regulation and Policy Making in W&B (28 responses)**



Source: NERA survey

Respondents provided a mixed view on GIB’s impact on encouraging technology innovation. Almost 10 per cent of respondents felt that GIB had a very high impact in this area, yet approximately 45 per cent expressed the view that the impact was either low or very low. Around 20 percent of respondents thought GIB’s impact was high across all four areas, but commercial innovation showed the greatest proportion of “low” impact, after technology. A large share of respondents either indicated that they did not know what impact GIB had had or that the impact was intermediate.

### 5.2.2. Appraisal of GIB’s Impact

In light of the evidence we gathered and reviewed, the most significant impacts of GIB on W&B are:

#### 5.2.2.1. Providing liquidity to the market

Increasing market liquidity has been an important impact of GIB. In contrast with the OSW sector, a much larger share (both in terms of the number of projects and the capital deployed) of GIB’s provision of financing to W&B has been in the form of debt, rather than equity.

This is in part a response to the need in the sector, where only a relatively small number of lenders have been willing to enter the market, because of the shift away from investment to serve the municipal waste market and the emergence of the commercial and industrial waste

sector as the key area where additional investment is required. Moreover, GIB has not closed any refinancing transactions in the W&B sector.<sup>46</sup>

A few of the projects that GIB lent to had particularly high private capital mobilisation rates, which were significantly higher than rates observed in the other transactions in the W&B sector as well as those in other sectors. Four projects had rates above 8, which were the Drax biomass conversion (18.8), the Merseyside Waste PFI (15.8), the Waste London Waste PFI (10.2) and the North Yorkshire Waste treatment plant (8.6). Whilst high mobilisation rates can be seen as a positive outcome, to the extent that GIB is encouraging high rates of private sector investment for each £1 that it spends, these mobilisation rates also raise the question of whether GIB was truly additional to the project. For example, for the Merseyside Waste PFI GIB provided the last £20 million to the total transaction value of £336 million. Although without GIB the project might have faced greater difficulty proceeding as planned, it seems likely that it would have gone ahead at some scale – albeit potentially with some delay.

GIB has primarily been involved in the initial financing of projects. In interviews and survey responses, market participants confirmed that GIB played an important role in filling short-term gaps in the capital supply to PFI projects (e.g. Wakefield, Gloucester, West London, Merseyside), but also credited it with filling gaps in the provision of long-term debt more generally. In this context, some market participants lauded GIB for “kick-starting” the funding process as well as its ability to structure and simplify transactions. More generally, GIB’s presence in transactions was deemed to have reassured investors (as in the offshore wind sector) and helped to crowd in capital, although this was not universally the case. Some expressed the view that in certain instances GIB’s participation in a project was seen as “soft” money and therefore may have signalled a riskier investment proposition. This is due to a perception that if GIB’s participation is necessary there may be risks in the project that have deterred other investors.

Drax was only able to attract one investor (M&G, part of Prudential) and had a limited timeframe to convert its units, given the RO deadline. Risks with the Drax project included the subsidy risk, fuel supply as well as the application of sustainability criteria to the fuel, which were not well understood in the market. GIB offered two tranches of investment: the first was £50m on a pari passu basis with M&G, the second was another £50m at a more expensive rate than M&G to incentivise Drax to find a more attractive proposal from the market. In the end Infrastructure UK provided a £75m guarantee to Friends Life at more attractive terms than GIB’s second tranche, limiting GIB’s final contribution to just £50m.<sup>47</sup> This is a case where two “liquidity-enhancing” government schemes (Infrastructure UK and GIB) filled the financing gap which the private sector was not comfortable with (at least on the terms that were ultimately agreed).

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<sup>46</sup> GIB has provided some details about refinancing transactions that it has considered but that ultimately the bank did not play a role in, for different reasons such as a lack of additionality or failure of the project to meet specific investment requirements.

<sup>47</sup> Details of this particular transaction are included as a GIB case study, available online here: <http://www.greeninvestmentbank.com/media/25297/108675-gib-case-study-drax-final.pdf>

### 5.2.2.2. Taking on technology and feedstock risks

Market participants highlight the technology risks associated especially with anaerobic digestion and advanced conversion technologies. By filling gaps in the financing of such projects, but also by its non-investment activity (e.g., a well-regarded study on anaerobic digestion and its detailed understanding of the sector in general), GIB helped these technologies become more established.<sup>48</sup> GIB also invested in several projects facing feedstock risks (waste wood and other merchant waste projects). Most of these “risky” investments have been equity investments through one of the W&B funds capitalised by GIB, especially the UKWREI fund managed by Foresight.<sup>49</sup> Some respondents suggested that this fund has been targeting deals at an early stage of their development with a risk/return balance that the remainder of the market has not been willing to accept.<sup>50</sup>

### 5.2.2.3. Aggregation of investment opportunities through funds

Fund investments were viewed by market participants as a positive approach to the sector, especially given the limited scale of opportunities now that the sector is now focused on commercial and industrial scale plants, rather than the large municipal scale waste plants.

GIB has committed capital to two fund managers that are active in the sector. Respondents noted that the Foresight fund had been relatively quick to deploy GIB’s capital across a number of projects, which has led to additional fund capitalisations from GIB. In contrast, the Greensphere fund has been slower to deploy its £30 million initial allocation, but we understand that it has a much smaller team and has also given GIB a different route to identify projects in need of financing. One respondent thought GIB was doing good work and moving in the right direction in terms of its approach to aggregating projects. However, the respondent – a large investment bank – had not yet invested in the sector and was not ready to, because ticket sizes remained too small and the overall scale was not there to easily invest in a portfolio of projects.

To date the fund-level investments that GIB has made are relatively small, compared to their direct investments in the sector and it is not clear from the evidence we have reviewed that GIB has yet been successful in scaling up or standardizing these in a way that will be attractive to institutional investors. It is also not clear if the market is ever going to be big enough for large investors.

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<sup>48</sup> According to one survey comment, GIB has “validated” various technology choices faced by the sector.

<sup>49</sup> While GIB’s direct investments in W&B have almost always taken the form of debt, its equity investment have mainly been through funds.

<sup>50</sup> Others, in contrast, criticise GIB’s “conservatism” regarding the technologies it has backed (having, e.g., stayed out of bio-refining and other “circular economy” activities related to waste).

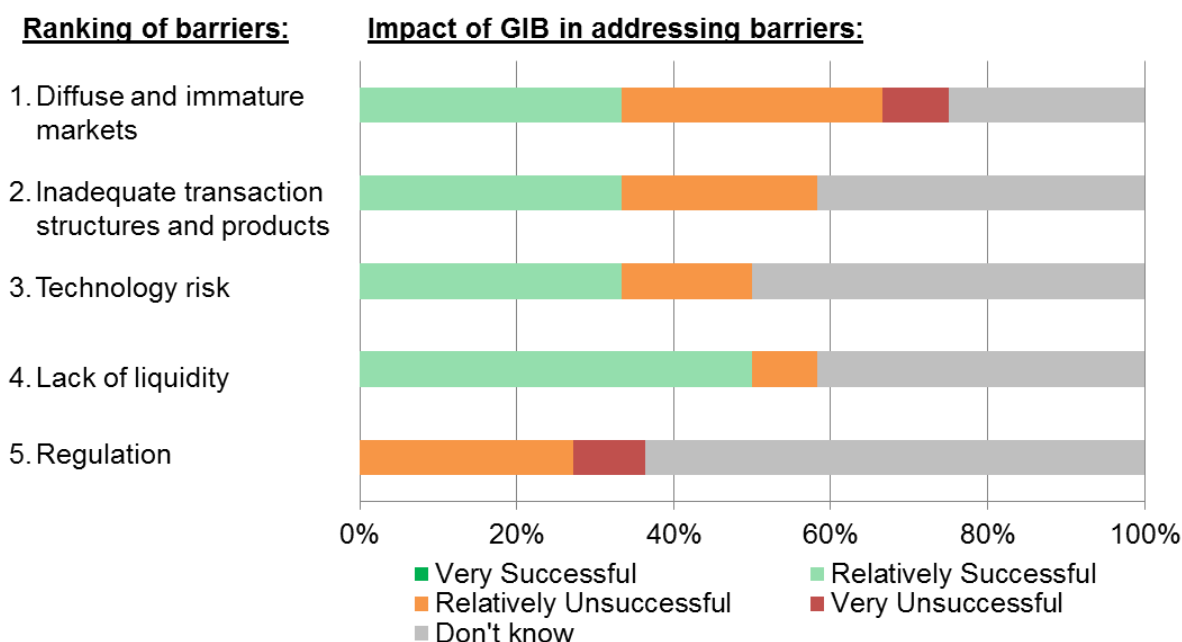
### 5.3. The Impact of GIB on NDEE

#### 5.3.1. Survey evidence on GIB’s impact

A total of 12 respondents answered our survey questions on GIB’s impact in the non-domestic energy efficiency sector to date, which is a smaller sample than we were able to obtain for the OSW and W&B sectors. The fairly low number of respondents requires treating our results with some caution.

Figure 5.7 shows the ranking of barriers on the left hand side and the bars illustrate the respondents’ assessment of how successfully GIB has addressed these barriers.

**Figure 5.7: Ranking of Barriers to Investment in NDEE before GIB Became Active in the Market and GIB’s Success in Addressing These Barriers (12 responses)**



Source: NERA survey

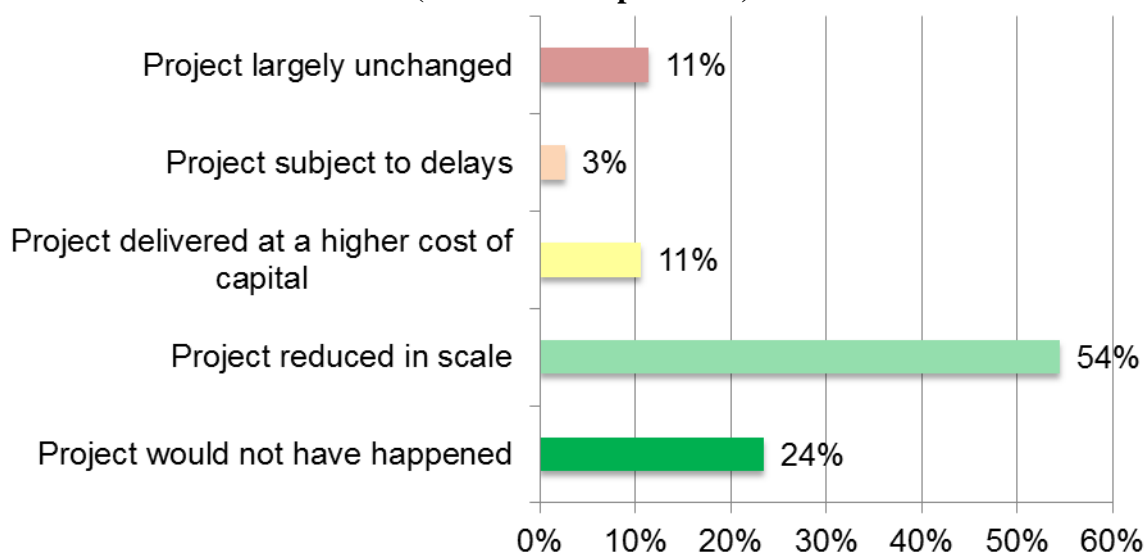
The ranking of barriers is noticeably different from how respondents ranked them for the OSW and W&B sectors. The biggest obstacle to private capital is the diffuse and immature nature of markets, followed by inadequate transaction structures and products, which is a natural corollary of the fact that markets are not well developed. An important caveat that should be kept in mind when interpreting the survey results for NDEE for these questions is that many, and in some cases most, respondents did not feel sufficiently informed to answer the questions (as reflected in the proportion of “Don’t know” responses), further limiting the sample size.

None of the respondents felt that GIB had been “very successful” in addressing any of the barriers to investment in the NDEE sector. A third of the 12 responses stated that GIB had been relatively successful at addressing the top 3 barriers, and half believed it had been relatively successful at addressing the liquidity issues in the market – but against this, the weight of responses suggesting that GIB had *not* been successful in addressing the most

important barrier (diffuse and immature markets) exceeded that of responses suggesting that GIB had been successful.

The responses to our counterfactual question, about the likely outcome of a given project, had GIB not been part of the transaction, are shown in Figure 5.8.

**Figure 5.8: Average Likelihood of Counterfactual Outcomes in NDEE Without GIB (based on 7 respondents)**

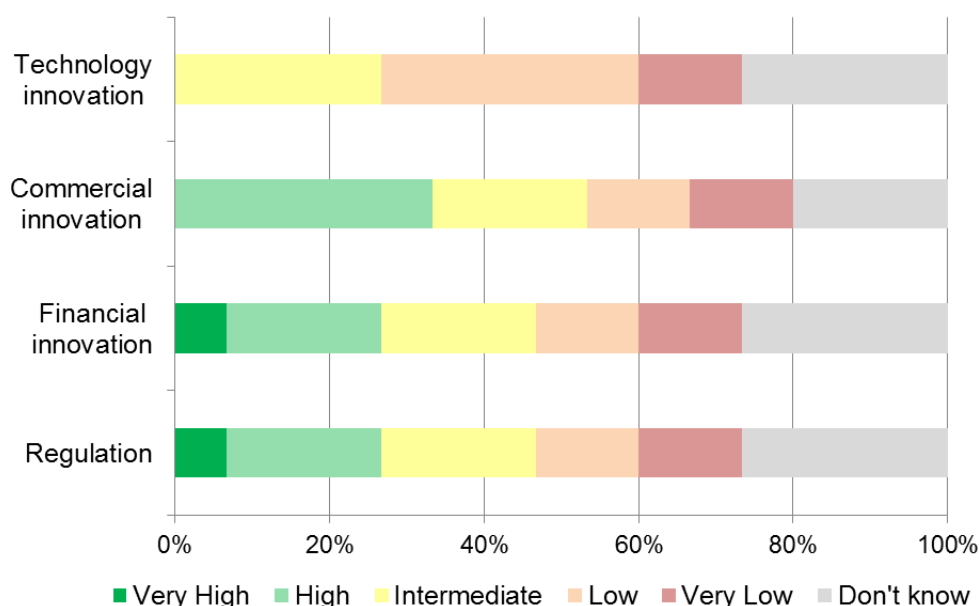


Source: NERA survey

In over half of the projects that GIB was involved in (again, weighted by transaction size) and for which we collected responses, respondents suggested that GIB's presence allowed the project to go ahead at a larger scale than would have been the case in its absence. A much smaller proportion of responses suggested that projects were not affected at all by GIB's participation than we found for OSW and W&B. But responses also suggested very limited influence on the speed at which projects would have otherwise been developed, or on the cost of capital. The responses suggested that almost a quarter of the investment supported by GIB would not have happened at all without its participation.

Finally, the responses to our questions on GIB's contribution to innovation and regulation (either assisting investors at getting comfortable with the regulation or working with government to improve it from the perspective of investors) in the NDEE sector are shown below in Figure 5.9.

**Figure 5.9: GIB’s Impact on Innovation and on Improving Regulation and Policy Making in NDEE (15 responses)**



Source: NERA survey

These responses suggest that GIB has had a limited impact on technology innovation, which is consistent with the view that the technology for implementing energy efficiency measures is relatively mature. Respondents were more positive about GIB’s ability to spur innovation in commercial models and financing models, with the results generally more positive than for W&B, but less positive than for OSW. This assessment reflects GIB’s focus on deployment of capital through Funds and its interest in new product development in the NDEE sector.

### 5.3.2. Appraisal of GIB’s Impact

In light of this survey evidence (bearing in mind that all results should be treated with some caution owing to the low sample size) and the findings that have emerged from the survey comments and follow-up interviews, the most significant impacts of GIB on NDEE are:

#### 5.3.2.1. Putting in place appropriate structures and products

Even though GIB’s deployment of funds to NDEE has been limited, market participants believed that GIB was moving in the right direction and helping the sector mature by putting in place a set of helpful financing structures and products (such as the sculpted loans to enable a pay-as-you-save model, as well as the project aggregation represented by the funds) and by working to demonstrate their viability to others.<sup>51</sup> Respondents remarked on the large team that GIB had assembled, with good understanding of the market and issues that it faced, and a clear commitment to working within the sector far beyond what was available at other financial institutions.

<sup>51</sup> In practice, despite delegating investment decisions to a specialised fund manager, our conversations with GIB staff indicate that GIB stayed involved in monitoring individual investments.



In developing the sector, GIB has had to do much work that commercial banks or other private-sector entities would not have been able or willing to do. An example is GIB's work with local authorities. The latter are an important host of potential energy efficiency projects, but structuring them can be challenging as it often takes local authorities a long time to make the relevant investment decisions. GIB's financing solution for installing energy-efficient street lighting in Glasgow is one example of success GIB has had in this area. Interviewees noted that this project may serve as a powerful demonstration to other Local Authorities that such investments can deliver savings and have a relatively short payback period on the initial capital outlay. In supporting the first such transaction, there are likely to be positive spillovers from GIB's efforts to get the project off the ground and from the transaction structure that it was instrumental in developing. In a similar vein GIB has also developed toolkits for energy efficiency investment for Local Authorities, which could serve as a model for others and raise awareness of the benefits of such investments.

There was also a feeling, however, that the deployment and replication of the models has not been very fast, and it remains to be seen whether GIB's projects or approach to funding them (via funds) will be replicated – and could therefore form the basis for the development of portfolios of projects from which similar stand-alone funds could be built.<sup>52</sup> For example, the Aviva fund has been in place for 3 years, but not deployed capital at the rate anticipated. For some, the importance of GIB's work consists in simply getting deals done to build a track record for the sector ("lending credibility" in the words of one commentator) and create awareness of its potential.

#### 5.3.2.2. Mobilising other players

A number of respondents believed that GIB had not been able to overcome inherent difficulties in the sector, such as the challenge of finding a balance between risks and returns that would be attractive to all parties to a transaction. Despite deploying most of its investment in the NDEE sector via funds, market participants have cautioned that GIB (and the fund managers deploying capital on GIB's behalf) has had limited success in identifying projects in which to deploy capital. Interviewees expressed the view that individual investments in the sector tended to be too small to attract significant volumes of capital, and that once transaction costs and incentive misalignment / information asymmetry were accounted for or compensated through appropriate sharing of project benefits, the returns to transactions were insufficient. Many felt that without the development and demonstration of standardised approaches that would allow the aggregation of smaller projects, it would be difficult to attract large capital volumes to the sector.

As discussed below, a number of respondents also expressed the view that addressing the challenges facing energy efficiency investments would be difficult within the constraints imposed by GIB's investment principles – in particular that they invest only at market rates.

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<sup>52</sup> GIB's loan to Glasgow City Council has enjoyed good visibility in the market.

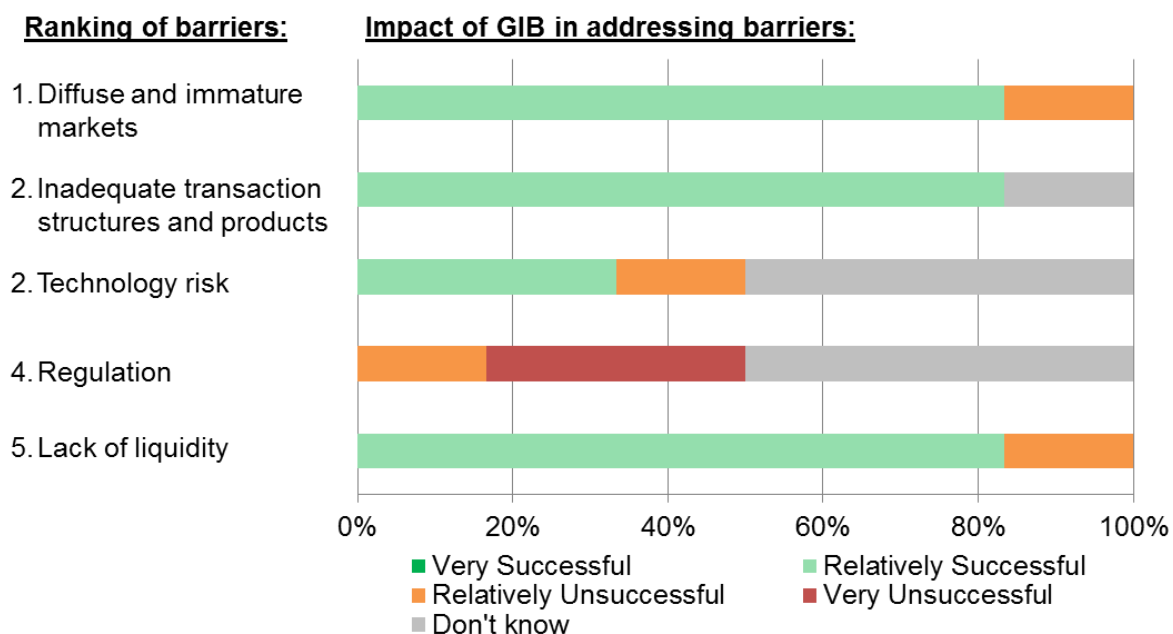
## 5.4. The Impact of GIB on SS RES

The small-scale renewables sector is the most recent area that GIB has been given investment approval for and, as such, there is only limited evidence on which to draw any conclusions as to its impact. There were fewer than 10 responses in this section, so although we present the survey responses that we received, we note that these results are not robust and should be treated with caution. GIB has only committed to two funds in the sector to date and has actually deployed only a very limited amount of capital at the time of writing.

### 5.4.1. Survey evidence on GIB’s impact

8 respondents answered our survey questions on the SS RES sector. Figure 5.10 shows their ranking of barriers to investment on the left hand side, with the bars illustrating the success that GIB has had in addressing these to date.

**Figure 5.10: Ranking of Barriers to Investment in SS RES before GIB Became Active in the Market and GIB’s Success in Addressing These Barriers (8 responses)**



Source: NERA survey

Keeping in mind the very small sample size, we can still make some observations about the results. Diffuse and immature markets, as well as inadequate transaction structures and products were ranked as the top 2 barriers to investment, with technology risk in joint second place. It is not clear from the comments received in the survey, or from our follow up interviews, why technology risk was ranked as such an important barrier, given that the relevant technologies (small-scale onshore wind and hydro) are all relatively mature and have a track record of investment even at the smaller end of the market. Aside from regulation and technology risk, which appears somewhat of an anomaly to us, respondents indicated that GIB has been relatively successful at addressing the barriers to investment. As noted above, however, these results are not particularly robust given the small number of respondents and the limited activity of GIB to date.

We do not present responses to the counterfactual questions, or the assessment of GIB's impact in terms of innovation and regulation as GIB has only made two commitments to funds in this sector and we did not receive enough responses to assess this activity.

#### **5.4.2. Appraisal of GIB's Impact**

Market participants noted that a key challenge for the sector is to find an effective way to aggregate projects together to package them up to a scale that investors are willing to carry out due diligence on. A couple of respondents noted that GIB had signalled its intentions by committing to channel its capital into investment vehicles, but all those we talked to cautioned that there was insufficient evidence to demonstrate that GIB had yet made an impact on the sector. A number of those we interviewed also expressed the view that, although there was a temporary liquidity gap in the wake of the Co-operative Bank exiting the market (which was one of the main justifications for GIB seeking European State Aid approval to intervene in the sector), this had largely been filled subsequently by other private actors without GIB's assistance. GIB's view remains that, because it has focused on the provision of *longer term* project finance, it is providing a product that is distinct from what others are offering, and that this remains an area where there is still a shortage of capital.

In short, GIB intervention in the SS RES sector does not appear to have made a material difference to date. This is largely explained by the fact that GIB has not participated in the sector for long enough to enable us to properly assess its success, or otherwise. According to our respondents, one of GIB's key rationales for entering the sector may be less relevant now, but equally the provision of longer term finance remains an area where GIB is offering a targeted and differentiated product. We discuss GIB's potential future role in the sector below in Chapter 6.

## **6. Future Role for GIB**

The second major part of our work is to examine the extent to which there remains a role for a publicly-funded GIB in the UK's green economy and what this role should look like in terms of the sectors covered, the products that GIB is able to offer to the market and the overall focus of the bank. The survey and follow-up interviews, along with discussions with both GIB staff and relevant government departments make up the main evidence base for our assessment.

This chapter first sets out some of the main, high level green targets in the UK over the next 5 to 10 years which provide the context for where and how GIB might play a role in assisting the government to achieve these objectives. We then describe the main sectors of the green economy that we included in our review and present the evidence that we gathered via both the survey and stakeholder interviews. In order to inform how GIB might best direct its capital and expertise in the future we then propose a framework for evaluating the need for GIB across the sectors of the green economy. The framework includes a number of conditions which our analysis suggests should be met for GIB to be an effective tool as well as different mechanisms for prioritising GIB's focus and capital. We finish the chapter by discussing the types of products that GIB might offer based on our survey results and stakeholder discussions as well as a review of the offerings of other green development banks.

### **6.1. The UK Government's Green Targets**

The future role of GIB needs to be set in the context of the government's environmental objectives. The decarbonisation of the UK electricity system, and the economy overall, is perhaps the highest profile element of the government's green agenda alongside further objectives across the energy sector, both at EU and UK level, to control and reduce carbon emissions in the production of heat and in the transport sector. There are a number of other green targets that span different sectors of the economy such as improvements in energy efficiency, the reduction of waste and increasing the reuse of materials, protecting ecosystems and areas of biodiversity and improving air and water quality. We do not provide an exhaustive list of government objectives here, but include a brief discussion of the UK's decarbonisation targets and corresponding policies below as well as a number of other non-carbon related targets.

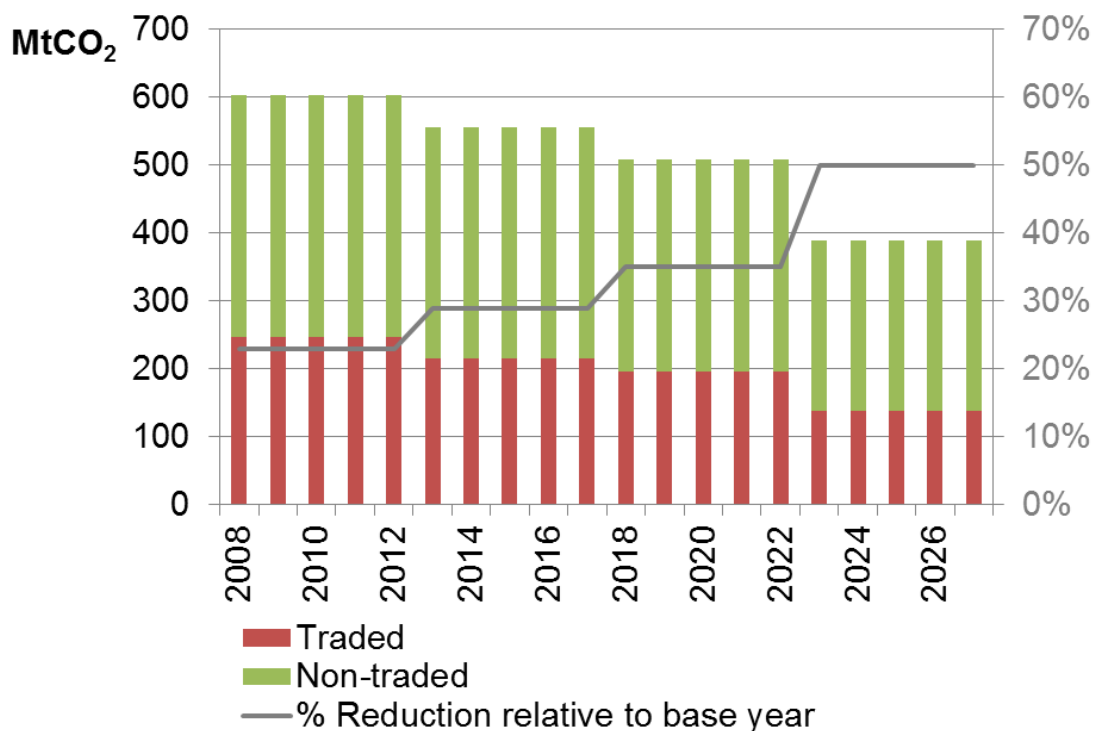
If the UK were already expected to achieve its environmental targets easily under existing policy there would be limited need to consider the role of a government-sponsored GIB. And even if it were not expected to achieve its targets, there are a variety of alternative policy tools that a government might draw on to create the right incentives to meet its targets. We discuss whether GIB is likely to be an effective tool, relative to other policy measures, later in this chapter. As we discuss in more detail below, our conclusion is that GIB has achieved success, and can continue to do so in the future, where capital is appropriately focused and deployed as a complement to other policies.

#### **6.1.1. Decarbonisation**

The overarching objectives in this area are set out in the Carbon Budgets. The government has set out 4 Carbon Budgets, each running for 5 years, which are currently in place until 2027. These targets underpin UK climate change policy making.

As can be seen from Figure 6.1, the carbon budgets decline over time from a 23 percent reduction on 1990 emissions levels in 2008-12 to a 50 percent reduction on 1990 emissions levels during the 2023-2027 period.

**Figure 6.1**  
**The UK Government’s First Four Carbon Budgets**  
**(Millions of Tonnes of CO<sub>2</sub> Equivalent)**



Source: DECC, *The Carbon Plan: Delivering our low carbon future*, December 2011.

Notes: 1. The percentage reduction is relative to base year levels. The base year for carbon dioxide, nitrous oxide and methane is 1990; for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride it is 1995.

2. The carbon budgets are defined as aggregate emissions over five-year periods. In the chart the five-year budgets have been annualized, reflecting the average annual budget over each budget period.

3. “Traded” refers to emissions covered by the EU ETS, as described in the following paragraphs.

DECC anticipates that the UK will meet the carbon budgets based on increased energy efficiency as well as the decarbonisation of heat, transport and power generation. DECC distinguishes between emissions reductions in the “traded” and “non-traded” sectors in its plans for decarbonisation and energy efficiency:

- **Traded sector:** The traded sector includes all activities covered by the EU ETS<sup>53</sup>, such as heavy industry and power generation. DECC's main efforts to reduce emissions in the traded sector will take the form of encouraging low carbon generation during the first four carbon budget periods.<sup>54</sup>
- **Non-Traded sector:** The non-traded sector includes emissions in all sectors not covered by the EU ETS, such as household gas consumption, commerce, and transport. DECC's current or planned policies to reduce carbon emissions in the non-traded sector include:
  - Improving energy efficiency of consumers' homes by supporting insulation and energy efficient boilers and introducing stricter building standards for new homes;
  - The Carbon Reduction Commitment scheme to encourage emissions reductions in large commercial premises;
  - Supporting the production of renewable heat through the Renewable Heat Incentive.
  - Reducing transport emissions by encouraging the deployment of electric vehicles through a system of grants, subsidies and exemptions and implementing emissions performance standards for new vehicles.

The UK is also bound by EU energy and climate change targets for 2020 and 2030, including a headline target for 15 per cent of final energy consumption to be sourced from renewables by 2020. These tend to follow the constraints imposed by the UK Carbon Budgets, but are less restrictive.

### 6.1.2. Other green objectives

In addition to reducing GHG emissions, there are also a number of other policy objectives and targets across the green economy. Many of these targets are established at the EU level, and then adopted by the UK. The EU Waste Framework Directive places a target on all Member States to recycle at least 50 percent of household waste by 2020. Domestic waste objectives are reinforced by a number of market interventions, notably the Landfill tax, currently set at £80 a tonne. Other relevant EU legislation includes the Water Framework Directive, which sets out water quality standards across a number of areas; National Emissions Ceilings and legislation applied to combustion plants, to ensure air quality; and the EU Biodiversity Strategy, which largely informs the objectives set out in Defra's Biodiversity 2020 report.<sup>55</sup> Many of these non-GHG related targets and ambitions, however, are not legally binding and the relatively weak penalties for non-compliance (political and/or financial) may themselves act as a barrier to private investment if investors perceive there is a relatively high risk that the government may not provide the policy support and certainty to deliver on its ambitions.

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<sup>53</sup> The EU ETS is the European Union's primary tool to address climate change. It is an EU-wide cap and trade scheme to regulate emissions from approximately 11,000 installations across the region.

<sup>54</sup> DECC, The Carbon Plan: Delivering our low carbon future, December 2011.

<sup>55</sup> Defra, Biodiversity 2020: A strategy for England's wildlife and ecosystem services, August 2011.

## 6.2. Sectoral Coverage

As set out above, GIB's operations were initially restricted to three core sectors, following analysis that was undertaken for the UK Government to select the sectors that GIB should focus on, namely: Offshore wind, Energy efficiency and Waste.<sup>56</sup> More recently, in 2014, European Commission State Aid approval was granted to extend GIB's mandate to include the Small-scale Renewables sector.

As part of our review we were asked to consider GIB's role in the future, over the next 5 to 10 years, in both the existing core sectors as well as other sectors of the green economy which are currently outside of GIB's mandate, but where a tool such as GIB might be effective at encouraging the required levels of investment to achieve green targets.

### 6.2.1. Overview of the sectors considered

In assessing the future role for GIB we have considered a wide range of green infrastructure sectors as possible areas for intervention by GIB. We agreed on the list of sectors (Table 6.1 below) in discussions with GIB and included these within our survey.<sup>57</sup> Whilst many of these could either be aggregated up into a higher level category (e.g. "renewable" or "low-carbon electricity" technologies) or disaggregated into more granular sectors (e.g. low carbon transport can be broken down into sub-sectors such as electric vehicles, biofuels, charging networks, or even by type of transport), the following breakdown represented a balance between a comprehensive coverage of green sectors of the economy and length of the list.

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<sup>56</sup> Vivid Economics, The economics of the Green Investment Bank: Costs and benefits, rationale and value for money, October 2011.

<sup>57</sup> The list of sectors is largely consistent with the sectors that Vivid Economics agreed with BIS to review in its appraisal of the case for a green investment bank (Vivid Economics, The economics of the Green Investment Bank: Costs and benefits, rationale and value for money, October 2011). We have considered a broader categorisation of low carbon transport and also included water and wastewater, interconnectors, transmission and distribution, agriculture, aquaculture and fisheries, biodiversity and ecosystem services and land remediation sectors. We also discussed the list of future sectors with government officials from DECC and Defra.

**Table 6.1**  
**Sectors Considered**

<b>Existing Sectors</b>	<b>Energy-related Technologies</b>	<b>Other Sectors</b>
Offshore wind	Carbon capture and storage	Agriculture, aquaculture and forestry
Waste & bioenergy	Energy efficiency (domestic)	Biodiversity offsets and ecosystems
Energy efficiency (non-domestic)	Energy storage	Land remediation
Small-scale renewables	Hydro power (large scale)	Water, including:
	Interconnectors (market to market)	- waste water treatment
	Low carbon transport	- water efficiency
	Nuclear	- catchment management
	Onshore wind (large scale)	- flood defences
	Smart metering	
	Solar PV (C&I rooftop)	
	Solar PV (domestic)	
	Solar PV (ground mounted)	
	Transmission and distribution	
	Wave and tidal	

The full list of sectors we considered includes both the existing four core sectors within GIB’s current remit, as well as a number of additional sectors that are currently outside of the areas GIB has a mandate to invest in. Our survey, the results of which we present in the following section, focused on the four existing core sectors. We also asked respondents about the additional sectors included in Table 6.1 and discussed the feasibility and likely effectiveness of GIB’s involvement across additional sectors through interviews with both government departments and private sector stakeholders, such as investors and project developers. A detailed assessment of each sector is beyond the scope of this work, but the evidence gathered through the survey and interviews, as well as our proposed framework for evaluating GIB’s future role (presented below in section 6.4), serve to highlight how and where GIB might be best deployed over the coming years, and how GIB, government, and/or other potential shareholders might evaluate the scope for green investment opportunities in other sectors.

### **6.3. Survey and Interview Findings on GIB’s Future Role**

This section presents our findings about GIB’s future role, first from the survey and then from the follow-up interviews that we conducted with market participants and government staff.

#### **6.3.1. Survey results: Future role of GIB**

##### **6.3.1.1. Ranking of barriers to investment**

For each of the four core sectors we included questions in the survey regarding the five barriers to investment that we consider throughout this report. We first asked respondents to rank the barriers to investment in order of their importance in the sector over the next five years (a “1” indicates the greatest barrier). Table 6.2 first reproduces the results shown earlier on *historic* barriers, before showing the ranking of *future* barriers for each existing core



sector in Table 6.3 (shown above in Figure 5.1, Figure 5.4, Figure 5.7 and Figure 5.10 in Chapter 5 above) for ease of comparison.<sup>58</sup>

**Table 6.2**  
**Historic Ranking of Barriers to Investment**

Historic Barriers	OSW	NDEE	W&B	SS RES
<i>Rank:</i>				
Technology risk	1	3	1	2
Regulation	3	5	3	4
Inadequate transaction structures and products	4	2	5	2
Diffuse and immature markets	5	1	4	1
Lack of liquidity	2	3	2	5

Source: NERA survey

**Table 6.3**  
**Ranking of Barriers to Investment Across Core Sectors Over Next 5 Years**

Future Barriers	OSW	NDEE	W&B	SS RES
<i>Rank:</i>				
Technology risk	2	3	1	5
Regulation	1	3	2	3
Inadequate transaction structures and products	4	1	5	2
Diffuse and immature markets	5	2	3	1
Lack of liquidity	3	5	4	4

Source: NERA survey

Regulation and technology risk were found to be the most significant future barriers to investment in both the offshore wind sector as well as in waste & bioenergy. For non-domestic energy efficiency and small-scale renewables the top two barriers over the next five years identified by the survey respondents are diffuse and immature markets and inadequate transaction structures and products.

It appears that a lack of liquidity is no longer considered to be one of the most important barriers to investment across all of the sectors, albeit we did not disaggregate sectors and there are therefore elements of sectors where this barrier remains a key issue (for example, equity investments in early-stage OSW assets). This change is also shown in Table 6.4 below, which compares respondents' views on the barriers when GIB was set up to the barriers now and into the next 5 years. A green, downward pointing arrow indicates that the barrier has a lower ranking now than when GIB was established in 2012 (i.e. it is less of an issue now that it was previously, relative to the other barriers). A red, upward pointing arrow indicates that

<sup>58</sup> The ranking was calculated by assigning a weight to each response, with the highest ranked barrier receiving a weighting of 8 and the lowest ranked barrier a 1 (whilst we specified 5 barriers we also included options for 3 additional "free choice" barriers which some respondents chose to include). We then summed up all of these weighted responses and ranked each barrier from 1 to 5 based on this total; the lower the number, the more important the ranking.

the barrier is now more important, relative to the others, and a sideways pointing blue arrow indicates no change in the ranking since 2012.

**Table 6.4**  
**Change in the Ranking of Barriers to Investment Relative to when GIB was Established**

Barriers	OSW	NDEE	W&B	SS RES
<i>Change since GIB entered market:</i>				
Technology risk	↓	→	→	↓
Regulation	↑	↑	↑	↑
Inadequate transaction structures and products	→	↑	→	→
Diffuse and immature markets	→	↓	↑	→
Lack of liquidity	↓	↓	↓	↑

Source: NERA survey

Regulation has become a higher ranked barrier across all of the sectors now than it was in 2012. The inadequate transaction structures and products is ranked similar to how it was ranked for 2012, apart from the non-domestic energy efficiency sector, where it is now the highest ranked barrier.

In the following sub-section we examine in more detail how well suited respondents felt GIB would be tackling these barriers.

### 6.3.1.2. Extent to which GIB is suited to address barriers to investment

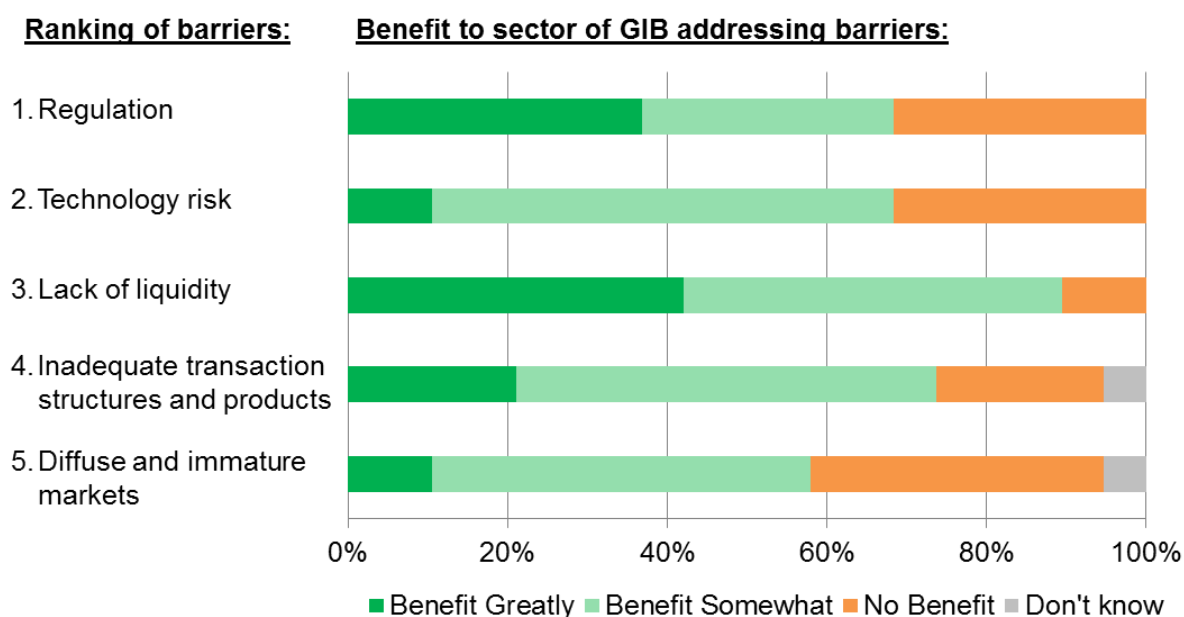
Having asked respondents to rank the barriers to investment across each of these sectors, we then asked them to what extent the sector would benefit from GIB addressing the barriers to investment. We provided four possible responses, which were “benefit greatly” (dark green); “benefit somewhat” (light green); “no benefit” (orange) and “Don’t know” (grey). The following charts show, for each sector, the extent to which respondents saw a role for GIB in addressing each barrier, according to the survey responses.

#### Offshore Wind

Figure 6.2 shows the results for offshore wind, for which 19 respondents answered the question. As before, the number of responses is somewhat low and hence necessitates treating the results with some degree of caution. The chart shows the share, in percentage terms, of each of the four possible responses, with the dark green area showing the proportion of respondents who thought GIB would be of “great benefit” in addressing the particular barrier, and the orange area representing the share of respondents that thought GIB was not suited to addressing the barrier. We note that respondents may have answered this question based on their opinion of how useful a “generic” green investment bank might be in addressing the barrier, or they may have answered based on their impressions of how successful GIB has been to date (and inferring that such success, or otherwise, is likely to continue), or a combination of these two.

The barriers to investment are shown in order of their ranking over the next 5 years as shown above in Table 6.3.

**Figure 6.2**  
**GIB's Suitability to Address Key Barriers: OSW (19 responses)**



Source: NERA survey

Across all of the five barriers over half of the respondents believed that the market would benefit, at least to some degree, from GIB’s intervention.

A lack of liquidity comes across as the barrier that GIB would be most effective at addressing in the offshore wind sector, with over 40 per cent of respondents indicating that there would be a great benefit from GIB’s presence in overcoming this barrier and only around 10 per cent indicating that there would be no benefit from GIB addressing this barrier. This is consistent with the respondents’ assessment of how successful GIB had been to date in addressing the lack of liquidity in the sector (approximately 40 per cent of respondents indicated that GIB has been “very successful” in addressing this barrier). As noted above, however, liquidity concerns have diminished across all sectors, and this is particularly relevant to the provision of debt and the acquisition of operational assets in offshore wind, for which it was the most important barrier that respondents identified when GIB was first established.

Regulatory risk is now ranked as the biggest barrier to private investment. Based on comments left in the survey and our discussions with industry stakeholders, this appears to be largely explained by the fact that the support available for new offshore wind projects (or for that matter any renewable technology) via the CfD budget is expected to be limited. This has the effect of decreasing the chances that a given project will be able to secure a CfD. On top of this, there is uncertainty about the level of overall ambition that the government has for the offshore wind sector, particularly in the years beyond 2020. This uncertainty may limit the number of investors interested in committing capital to the sector.

It is not clear what GIB can do to mitigate against this particular element of the barrier to investment, although almost 70 per cent of respondents indicated that there could be some benefit from GIB’s involvement in the sector. It is possible that respondents ranked it as the

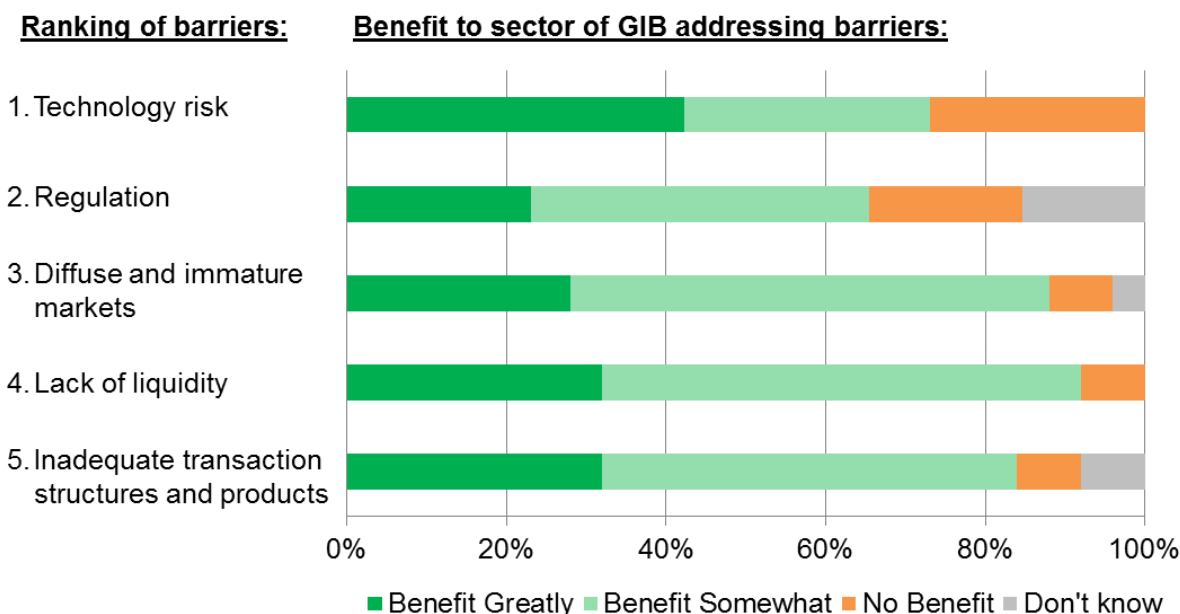
most important barrier based on concerns about the available CfD budget, but that when they considered the benefit of GIB’s involvement they had in mind its knowledge and experience of UK regulation and the implications these have on the project risks. It may also be that market participants see GIB as a trusted intermediary who is able to inform government of the issues faced by, and needs of, fellow investors and project developers.

Technology risk is ranked as the second most important barrier to investment in the OSW sector, and almost 70 per cent of respondents suggested that GIB could help mitigate this barrier to some extent. This may be an indication of support for GIB to involve itself in some of the riskier projects in the market, such as those in deeper waters, or to continue to invest in projects using relatively new technologies.

**Waste & Bioenergy**

Figure 6.3 shows the survey responses for the waste & bioenergy sector, for which we received 26 responses, which is high relative to the number of responses achieved elsewhere in our survey, but still not particularly high in absolute terms. As for OSW, regulation and technology risk are now the top two barriers, although their positions are switched for W&B.

**Figure 6.3**  
**GIB's Suitability to Address Key Barriers: W&B (26 responses)**



Source: NERA survey

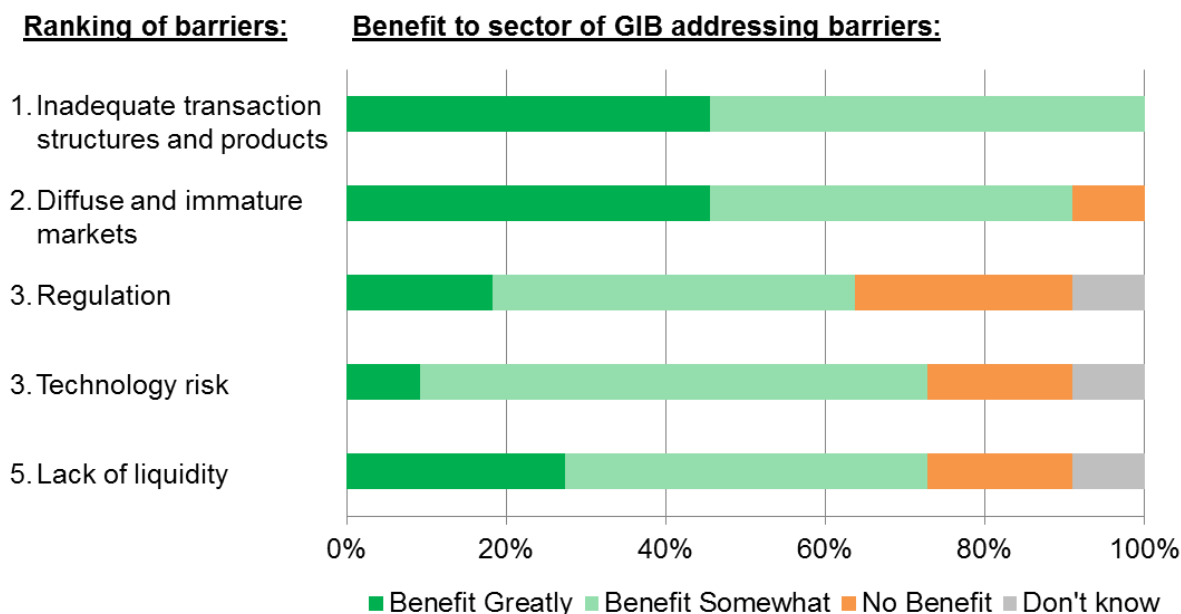
Technology risk – the top ranked barrier to investment – was the barrier that most respondents (over 40 per cent) thought could benefit greatly from GIB’s involvement. It is interesting to compare this result to respondents’ assessment of GIB’s success *to date* in mitigating technology risk (see section 5.2.1): around 10 per cent of respondents thought GIB had been “very successful”, and an additional 50 per cent thought GIB had been “relatively successful”.

A majority of respondents, 65 per cent, felt that GIB’s involvement would be of benefit in addressing the second most significant barrier, regulatory risk, with 25 per cent indicating “great” benefit and 40 per cent “some” benefit.

### Non-Domestic Energy Efficiency

Only 11 people responded to this question for the non-domestic energy efficiency sector, the results of which are shown in Figure 6.4. This shows near consensus that GIB could have an important role to play in addressing the top two barriers in the sector, the immaturity of markets and lack of suitable products and transaction structures. All respondents either thought that the sector would benefit greatly, or benefit somewhat from GIB addressing the barrier of inadequate transaction structures and products, with over 40 per cent saying that the sector would benefit greatly. Similarly, over 40 per cent of the responses indicated that the sector would benefit greatly from GIB addressing the issue of diffuse and immature markets. Although low number of responses signals a need for caution, this is mitigated to some extent by the near unanimity of views on GIB’s potential to address the top two barriers.

**Figure 6.4**  
**GIB's Suitability to Address Key Barriers: NDEE (11 responses)**



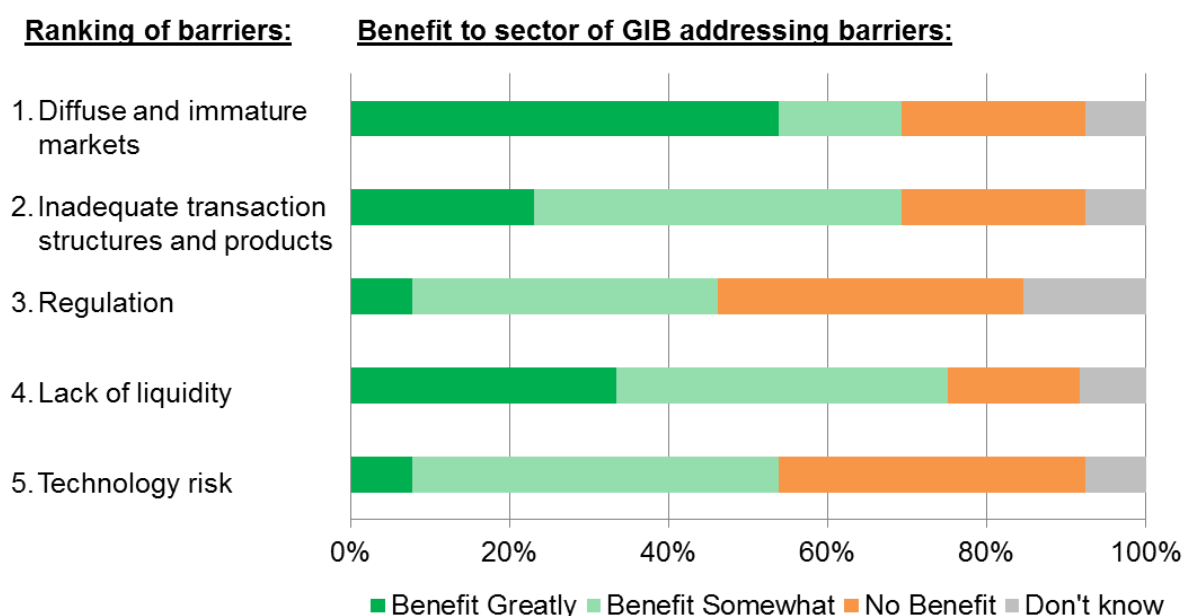
Source: NERA survey

These results for the NDEE sector indicate that there is a role for GIB to make a positive contribution to breaking down the barriers to investment in the market. Our survey findings for GIB’s impact to date, however, as well as our follow-up interviews, suggested a feeling among market participants that so far GIB has had mixed success in addressing these barriers. This implies that respondents would support GIB’s continued participation in the sector, but also suggests that the approach may need to change in order to be more successful in tackling the barriers.

### Small-Scale Renewables

Figure 6.5 shows similar results for the small-scale renewables sector, for which we received 13 responses, which is again too low for a high degree of confidence in our numerical results (particularly given the more mixed set of responses). Over half of the respondents felt that the sector would benefit greatly from GIB addressing the barrier to investment of diffuse and immature markets, which was ranked the most important barrier. Respondents were also optimistic about GIB’s ability to help develop new transaction structures and products (the second most significant barrier), and to address liquidity concerns (ranked fourth). Approximately half of respondents answered that the sector would either not benefit from GIB addressing the barriers of regulation or technology risk or that they did not know. These results seem to suggest that if GIB could develop a product that was able to aggregate a large number of relatively standardised small-scale projects with similar characteristics, this could provide a boost to the sector. It is too early to tell what impact GIB’s initial allocations to investment vehicles will have on the sector.

**Figure 6.5**  
**GIB's Suitability to Address Key Barriers: SS RES (13 responses)**

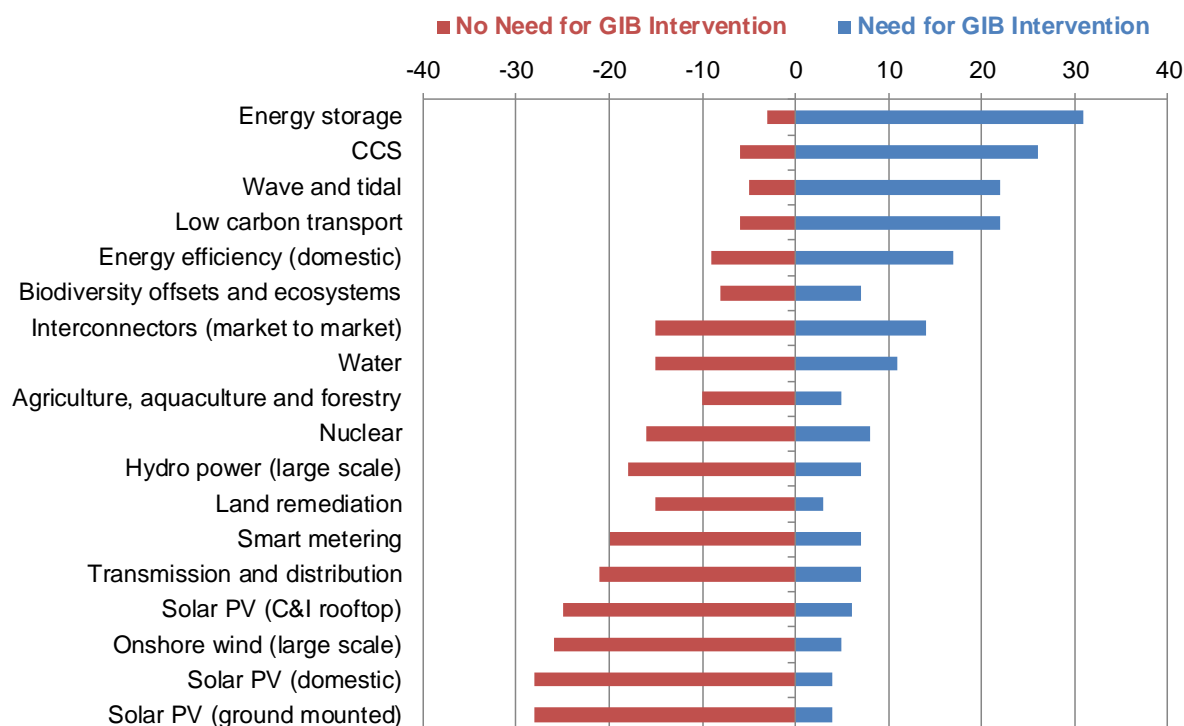


Source: NERA survey

#### 6.3.1.3. Need for GIB intervention in other sectors

As noted above, our survey presented respondents with the list of sectors shown in Table 6.1 (above) and asked whether there was a need for GIB intervention over the next 5 years. The answers to this question are shown below in Figure 6.6.

**Figure 6.6**  
**Ranking of Sectors Identified as Having a Need for GIB Intervention (40 responses)**



Source: NERA survey

Note: Sectors are ordered according to a simple scoring rule that assigns one point for each positive response and deducts one point for each negative response. From Biodiversity offsets down, more respondents provided negative responses than provided positive ones.

There are no examples in which either all respondents expressed the view that there was a need for GIB intervention or all respondents expressed the view that there was *no* need for GIB intervention. Energy storage, CCS, wave and tidal, low carbon transport and domestic energy efficiency all ended up with positive scores, which means that more respondents believed there was a need for GIB intervention than those that felt GIB intervention unnecessary. The results also provide a clear indication that the majority of respondents felt that there is not a need for GIB to intervene in solar PV or large-scale onshore wind markets.

### 6.3.2. Interview findings: Future role of GIB

In addition to the online survey, we carried out a number of follow-up interviews in which we discussed the future role of GIB across individual sectors. This sub-section presents the key findings from these interviews first for each of the core sectors and then for other sectors that GIB is not currently active in.

#### 6.3.2.1. Offshore wind

Almost all interviewees indicated that there remained a role for GIB to continue to participate in the offshore wind sector, but highlighted that the focus of this role should be more aligned with its most recent investments, taking on equity stakes in earlier stage construction projects.

There was a general consensus across the market participants we spoke to that liquidity was no longer an issue, at least across later stage construction and (refinancing) operational projects and that there was now sufficient capital and a relatively large pool of investors that were comfortable with the sector in the UK, given that it now has something of a proven track record. This has been reflected in GIB's move out of acquiring operational projects, which will now be completed by the OSW Fund managed by a GIB subsidiary which is majority private sector funded.

Several interviewees noted that the Levy Control Framework budget cap implied that there was unlikely to be a significant number of additional projects receiving CfD support (in addition to those that have already been awarded a contract through either the FIDeR process or in the first CfD allocation round) over the next few years, which would potentially limit, to some extent, the need for GIB intervention. However, some of these interviewees noted that if the UK wished to keep to its ambitious decarbonisation targets in the electricity sector through the 2020s, this would likely imply a large amount of additional investment in the offshore wind sector and that GIB's involvement could help to realise these projects.

As well as a need for GIB to focus predominantly on construction risk, where other lenders or investors are still not completely comfortable investing, some respondents suggested that GIB might play a role in advancing new technologies, such as offshore wind farms built on floating foundations (where pilot projects struggle for financing) or that GIB should be focusing on encouraging the development of riskier projects, particularly those looking to build in deeper waters. Another respondent thought GIB should become more active in explicitly supporting UK-based industrial development of the sector, rather than acting only as an infrastructure investor, an area that to date GIB's State Aid approval does not allow. A number of interviewees noted that over time the need for GIB to play a substantial role in the sector was likely to diminish. Some highlighted that there was an increasing risk that GIB would begin to compete with other banks and capital providers, rather than crowding-in their capital; others remarked that, as the sector matured and sufficient investors had gained experience in UK offshore wind, GIB's capital might be more effectively deployed elsewhere in more nascent technologies and markets.

Amongst those we talked to, there was a mixed reaction regarding the value of GIB's offshore wind fund to the sector. Some interviewees agreed that the fund was a helpful step in encouraging even more investors into the sector in the UK who had not previously been active in it, especially those with large pools of capital and little appetite to invest the time to carry out due diligence at the project level. Others, however, questioned whether it was the right step for GIB to take, suggesting that it may have the effect of crowding-out other investors or fund managers, and that GIB capital might be more effectively deployed either in other activities within the sector, or into other sectors.

This suggests that the operation of the Fund should be monitored closely, as should the development of similar funds in the sector, to reassure market participants that GIB has no interest in being the sole provider of such a portfolio investment option – and to promote the diffusion of a successful fund concept across the sector.



### 6.3.2.2. Waste & bioenergy

As we highlighted earlier in the review of the impact of GIB to date, GIB appears to have had a positive impact on the waste and bioenergy sector, providing “reassurance” to co-investors and, for certain projects, stepping in as funders dropped out or PFI credits were withdrawn. Interviewees noted that there was a considerable amount of uncertainty facing the sector in the future, as attention shifted away from investments in large municipal waste plants and towards plants relying on commercial and industrial waste streams, which are perceived to be less secure.

Scale and security of fuel supply were both noted as key risks and potential barriers to future investment by those we talked to. Some respondents noted that if GIB could develop a product to take on some of the risks associated with the provision of feedstock this would likely make projects significantly more attractive to commercial investors. Regulatory uncertainty regarding support for both electricity and heat generation was also raised as a key barrier to investment over the next 5 years. Two respondents also noted that uncertainty regarding the EU and UK action on the circular economy was also a concern. Most of those that were concerned about the regulatory environment, however, noted that this was more of a challenge for government policy to address, rather than GIB, and recognised that GIB would not be particularly effective at encouraging investment if policy support were not in place to provide long-term stability to investors.

A number of industry participants that we talked to thought GIB should be prepared to take on more risk in the sector than other banks, and focus its attentions on developing the markets for less mature bioenergy technologies. One respondent expressed the view that GIB should aim to be active along the technology “frontier”, working to “nudge” projects and/or technologies that are on the verge of being commercial. This view seems consistent with observations by other respondents, who told us that a number of projects have recently achieved financial close without GIB involvement in the more conventional parts of the market, where the technology risk is relatively low. There is, however, a risk that by pursuing riskier, less-proven technologies, GIB ends up offering venture capital, which would mark a significant departure from its current approach.

### 6.3.2.3. Non-domestic energy efficiency

As discussed in Chapter 5, GIB has found it harder to deploy capital into the non-domestic energy efficiency sector, than into the offshore wind and waste sectors. Most of the industry participants that we talked to agreed that this was a particularly difficult area into which to encourage investment, potentially requiring a step change in approach. Interviewees highlighted that this was a sector with limited government policy in place to support investment, largely because of a perception that it ought to be possible to earn attractive returns without additional public subsidy. However, despite the notion that attractive returns are there for the taking, there appears to be a lack of appetite from businesses to invest in energy efficiency. Some respondents attributed this to a lack of understanding of the technology risks, others highlighted the barrier that investments typically need to be made on balance sheet, with negative implications for credit ratings, and many simply attributed the inertia to the significant “hassle” factor, especially where energy costs are not a particularly material cost item for a business and other capital projects offer better payback periods.

In general, investors, project developers and government staff all agreed that GIB could continue to play a useful role in the sector, but that this role might need to change or shift its focus from the current approach. A number of respondents noted that GIB was currently offering products to the market similar to what was offered by commercial banks, and highlighted that a material change in investment into the sector could only be achieved if GIB were to differentiate itself from the rest of the market. Whilst different people offered different views on what GIB might do in the future to stimulate investment in non-domestic energy efficiency, a common theme emerged that GIB should consider offering products to the market that either required lower returns or took on higher risk than other commercial banks are prepared to accept – essentially providing some form of concessionary finance.

Most respondents acknowledged that such an approach was out of line with GIB’s current objective to offer products at “market” or “commercial” terms (and indeed the current terms of its State Aid approval), but emphasised that it appeared the most effective way to kick-start investment. A few respondents also drew parallels to the successful efforts of the development bank KfW, which has used concessionary finance to stimulate the uptake of both domestic and non-domestic energy efficiency measures in Germany (we discuss other green development banks, such as KfW, below in section 6.7.2). The types of product offering that interviewees noted included:

- Partnering with developers to share in development costs;
- Offering credit enhancements to make it more attractive for businesses to borrow funds to invest in energy efficiency measures;
- Providing subordinated debt or first loss guarantees into transactions, alongside other investors.

Another theme of suggestions for GIB’s future role in the sector was for it to focus on reducing some of the transaction costs associated with evaluating and implementing energy efficiency measures. Interviewees suggested that GIB might play a larger role in developing more standardised products that it could invest in initially and help develop a track record of success. A proven pipeline of projects could then be used to stimulate both demand from business and the corresponding supply of capital from the private sector to support these projects. A limited number of respondents also recommended that GIB play a role in either validating or guaranteeing savings, which would further remove some of the risk that prevents companies from investing in projects to improve energy efficiency.

#### 6.3.2.4. Small-scale renewables

Of the four core sectors, the market participants that we spoke to were least in favour of maintaining GIB intervention in the small-scale renewables sector. Interviewees noted that there remained some barriers to investment in the sector, most notably related to the limited scale of projects and the resulting diffuse nature of the market. However, almost all respondents agreed that the temporary liquidity gap, left in the wake of the Co-operative Bank’s withdrawal from the market, had now largely been filled. A few respondents noted that GIB could continue to play a role in aggregating projects and helping project developers to obtain access to financing at an earlier stage in the development phase. However, no one offered us any clear vision on how GIB might successfully act to aggregate projects in the sector to further stimulate investment.

Both government officials and investors expressed the view that the existing policy support in place for onshore wind and small-scale hydro projects was sufficient to encourage the investment required to meet the UK government's 2020 renewable targets for the electricity sector. A number of respondents noted that the key barrier to investment at the moment was associated with the early withdrawal of support to solar PV (and more recent proposals to do the same for onshore wind) under the Renewables Obligation scheme and recognised that, whilst this may have the effect of discouraging investment, it was not the role of GIB to look to encourage investment in the absence of this support. Other interviewees therefore provided little indication that there was a clear case for GIB to continue to invest in the small-scale renewables sector in the current market conditions.

#### 6.3.2.5. Other non-“core” sectors

As well as the four core sectors we also discussed with a number of investors and government representatives how GIB might play a role in additional sectors in the next 5 to 10 years. The majority of those we spoke to thought GIB should consider investing in additional sectors and a number of them noted that this was a natural progression for the bank to make as other investors became more comfortable investing in offshore wind and waste and bioenergy projects.

Some respondents highlighted that one of GIB's key successes to date had been in developing a solid understanding of the risks and investment requirements for a particular sector (for example, in offshore wind) which enabled it to make co-investors more comfortable to provide capital into a project alongside GIB. These respondents therefore cautioned against GIB opening up to too many sectors of the green economy at once, and thereby diluting its sector-specific knowledge.

Another key theme that emerged from our discussions regarding additional sectors was an appetite for GIB to work with both government and project developers to prepare certain sectors to attract investment. Interviewees noted that there are a number of sectors in the green economy that have lagged behind the renewable power sector in terms of developing markets with attractive returns to encourage significant amounts of private capital. Sectors that were mentioned in this context ranged from forestry and ecosystem services more generally, to energy storage, heat networks, and electric vehicle charging infrastructure. Those advocating GIB's involvement in these sectors suggested that GIB may therefore be in a position to offer advice to help these sectors prepare the conditions to become ready for private sector investment. This could include discussions with policy makers about what sort of direct intervention would create the market conditions to attract private capital as well as discussions with project developers about how to best structure their project(s) to suit lenders and investors.

Echoing the results of the survey, a number of interviewees highlighted energy storage as a sector that GIB should be looking at, although these respondents recognised that the technology was still at an immature stage and that there was insufficient policy framework in place to encourage investment at the moment.

Other technologies that a number of interviewees identified as good candidates for GIB intervention included CCS and nuclear projects. Whilst both of these technologies are likely to qualify for CfD support, several investors acknowledged that much of the capital required

for these large scale projects would need to come from foreign investors and that these might be more likely to be reassured by GIB's participation alongside them in any transaction, effectively demonstrating that the government (via GIB) is willing to invest its own capital in such large infrastructure projects, providing "skin in the game".

In a similar vein to the comments we received around non-domestic energy efficiency, a few respondents indicated that GIB could also play a role in stimulating investment in domestic energy efficiency, highlighting again that this might best be achieved through some form of concessionary finance product. It is however, less clear how this approach might crowd-in other investors into the sector – one of GIB's core objectives – and this point was also acknowledged by those with whom we discussed the sector, as was GIB's discontinued involvement in supporting the Green Deal.

#### **6.4. Framework for Evaluating the Need for GIB**

Based on our discussions with GIB staff, government departments and, to some extent, industry participants there appears to be an appetite for GIB to have greater flexibility with regard to the sectors that it focuses its investment activities in. A reduction in the sector limitations would allow GIB to react more dynamically to changing needs, which as we have highlighted in our assessment of GIB's impact to date earlier in this report (Chapter 5) have already been in evidence both within a sector as well as across different sectors.

A potential disadvantage of opening up GIB's remit to a wider number of sectors is the risk that, in doing so, it dilutes GIB's efforts in its core sectors and reduces the specialist sectoral knowledge and experience that GIB is able to bring to transactions. Many survey respondents and investment partners that we interviewed emphasised this as one of the key factors in the success that GIB has had in crowding-in capital to different sectors. Similarly, allowing GIB to choose from different sectors could diminish the impact of the *Government's* identification of specific sectors as meriting GIB's special attention. There are also legal State Aid considerations, which may constrain the extent to which GIB is able to operate across sectors without seeking approval each time. Such assessment of the State Aid rules and guidance is, however, beyond the scope of this work.

A clear message emerging from our review is that GIB's role, as a complement to other policy measures, is most effective in encouraging the development of relatively immature sectors, where private sector financiers lack the resources to fully engage with and understand the technology and regulatory risks. As the technology and regulatory landscape is continually shifting and developing – along with the resulting flows of capital – we think that it is appropriate for GIB to regularly assess where its capital and expertise can be most effectively deployed in order to assist the government in achieving its green objectives. At the same time, as the previous paragraph suggests, we still see benefits from focusing on specific green sectors that GIB and/or the government has singled out as particular priorities.

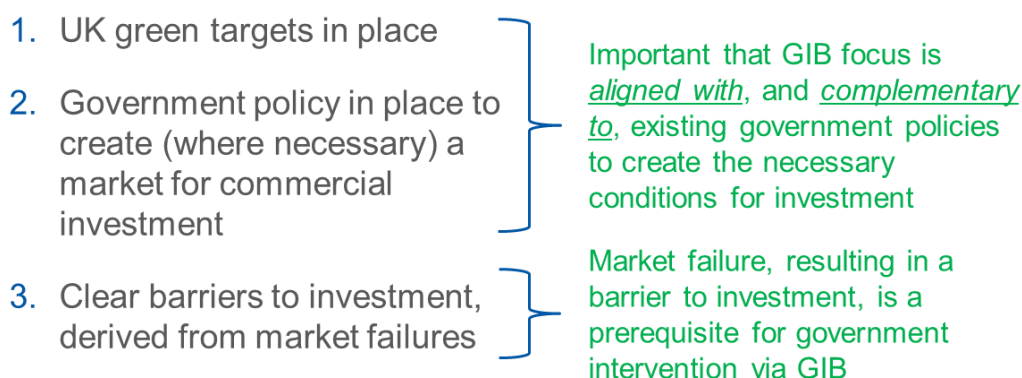
With this in mind we have developed a high level framework to assist in evaluating the need for GIB to utilise public funding, made up of key conditions for GIB's involvement as well as proposals for metrics that provide the rationale for GIB to prioritise a particular sector. The three conditions that we have identified, through our evaluation of GIB's impact to date, are described in the following paragraphs. We also set out the different metrics that can be used to prioritise GIB's sectoral focus. This proposed framework is intended as high level

guidance, based on our assessment of the findings from our discussions with market participants, including government staff. A fully developed process would require a more detailed review of approach and consideration of the structure of the bank, which are beyond the scope of this study.

### 6.4.1. Conditions for GIB involvement

The following diagram, in Figure 6.7, sets out the three high level conditions we believe should all be met to justify any intervention by GIB, using public funding, in order to ensure that its investments are in line with government policy and aimed at addressing underlying market failures.

**Figure 6.7**  
**Requisite Conditions for GIB Intervention**



We would consider it a prerequisite that GIB not only invests in the green economy, but that it does so in areas where the government has specific targets that set out how the sector needs to develop over a given timeframe. This ensures that GIB's focus is aligned with that of the government.

Government targets alone are unlikely to be sufficient to create the necessary market conditions for investors to earn a suitably attractive return, especially in the presence of market failures. Our second condition is therefore that adequately developed government policies are in place to help create a market for commercial investment. Subsidies to renewable electricity generators and carbon pricing are both clear examples of government policy that creates incentives for investors; without such policies investors would not be able to earn an adequate return on their investment. To date, GIB has been most successful at attracting additional investment into markets that are supported by government policy.

It is also important to highlight that, as a government tool, GIB's presence alone is unlikely to create the conditions to attract investors and to earn commercial rates of return. It is therefore important that GIB's role is seen as *complementary* to existing government policies and not as a *substitute* for alternative policy options that can work to create the appropriate market conditions. GIB's role is to bring private sector capital into functioning markets, not to be a substitute for functioning markets.

Market failures lead to barriers to investment, which the market alone is ill-equipped to address, and which motivate the need for policy intervention of some form, either via direct policy or regulation, or via the actions of an entity such as GIB. Our third condition is that there are clear barriers to investment in a given sector, which are derived from market failures. It should be clear that there is no role for GIB in the case that either sufficient investment is already flowing freely into the sector, or where, in the *absence* of market failures, investment is not forthcoming simply because returns on investment remain unattractive. This may be the case if the risk/return balance of a project is simply too high, even in the absence of market failures. GIB's for-profit motive ensures this is given appropriate weight in decision making.

#### **6.4.2. Metrics to prioritise sectoral focus**

These three conditions are likely to be met by a number of different sectors, from which GIB would need to prioritise its focus to ensure that it is not only supporting government policy in tackling market failures, but deploying its capital to those sectors where it can achieve the most effective results in terms of attracting private sector capital. One option to assess the relative importance of the need for intervention is via a survey, similar to aspects of the one that we have carried out for this report, in which market participants are asked to provide their views on the sectors that could most benefit from GIB's intervention and to rank the barriers to investment across these sectors.

Another option is to estimate the funding requirements of the sector, relative to other competing needs across the green economy. Funding requirements, which can be quantified based on the distance to achieving the government's green targets, are a useful means to prioritise across sectors and ensure that GIB's public funding is deployed where it can be most effective.

This need not mean that GIB should focus exclusively on those sectors with the largest funding requirements. It may be more relevant to estimate the funding *gap* – that is, the amount of the required financing that will *not* be provided by the market under current conditions and policy – to decide where GIB capital can be most effective. Even if the absolute level of funding required over a given number of years is not the most significant in the green economy, if the step up in ambition is such that new investors need to come into the sector then GIB may be best placed to facilitate this.

A combination of these options can be used to prioritise where GIB directs its attentions across the green economy. To illustrate this we provide examples for the first two options below in section 6.6 and also briefly discuss the funding gap across different sectors, although do not quantify it here.

#### **6.5. Assessing the Need for Green Investment**

The first step of our proposed framework is to assess the extent to which a number of different sectors meet the three conditions we set out in section 6.4.1 above, namely that UK green targets are in place, policy has been implemented to create the conditions for investment and that significant barriers to investment exist. In the following paragraphs we

briefly discuss these conditions for two of the sectors that GIB is currently active in<sup>59</sup> as well as the top three sectors identified by our survey respondents as those which have a need for GIB intervention. These sectors, shown above in Figure 6.6, include energy storage, CCS and wave and tidal. Our aim here is not to provide a detailed evaluation of all sectors, but to illustrate how the framework might work in assessing GIB's future role with a number of examples. Table 6.6 provides a summary of our findings with respect to satisfying the conditions for GIB intervention in the five sectors we consider for illustration. We elaborate on the details of the policies and their relevance to the different sectors in the paragraphs below.

**Table 6.5**  
**Summary of Framework Analysis for 5 Sectors**

Sector	UK Green targets	Policy Support	Barriers to Investment
OSW	UK 2020 RES target	RO/CfDs; carbon pricing	Technology risk; regulation; lack of liquidity
NDEE	UK 2020 "indicative" EE targets; UK 2020 RES targets	CCAs; CRC; carbon pricing; Green Deal; Salix Finance	Lack of transaction structures; diffuse and immature markets
Energy Storage	Future (unknown) RES and security of supply targets	UK Capacity Market	Regulation; immature markets; lack of transaction structures
CCS	UK long-term decarbonisation targets	CfDs (in future); carbon pricing	Technology risk; lack of transaction structures
Wave & Tidal	UK 2020 RES targets; UK long-term decarbonisation targets	CfDs; carbon pricing	Technology risk; lack of transaction structures; immature market

Following our discussion on whether these five sectors (two existing ones as well as the top three additional sectors included in our survey) satisfy the conditions for GIB involvement we then include some analysis on how one might prioritise across sectors in order to deploy GIB's capital most effectively.

### 6.5.1. Offshore Wind

#### 6.5.1.1. UK green targets in place

The headline target driving the deployment of offshore wind – and all renewable electricity generation in the UK – is the government's ambition for 30 percent of electricity generation to come from renewable sources by 2020. This is part of the government's binding commitment to deliver 15 percent of final energy consumption from renewable sources by

<sup>59</sup> We selected OSW and NDEE from amongst GIB's existing core sectors to illustrate our framework approach as they represent relatively distinct types of investment, reliant on a different set of policy measures. Nothing is intended by the omission of Waste and Bioenergy or of Small-Scale Renewables – we simply have not selected them for the illustration.

the same year, which itself is part of the headline EU 2020 target for 20 per cent of final energy consumption to come from renewables across the whole region. There are currently no national UK renewable targets beyond 2020, although if the government is to achieve the decarbonisation of the electricity sector that is required by the legally binding Carbon Budgets (described above in section 6.1.1) renewables, among them offshore wind, are likely to continue to play a significant role.

The government has set out that offshore wind is a key part of achieving these renewable and decarbonisation targets. We therefore consider that this condition is met.

#### 6.5.1.2. Policy in place

There are a number of policies in place to incentivise investment in offshore wind. The headline policies are the Renewables Obligation (RO) and the Contracts for Difference (CfD) subsidy regimes which both offer additional revenues to offshore wind generators on top of the market electricity price. Carbon pricing also has the effect of increasing the cost of generating electricity using fossil fuel inputs and therefore acts to reduce the cost differential with renewable generators. In the UK fossil fuel generators are obliged to purchase emission allowances to offset their carbon dioxide emissions as part of the EU ETS, and they are also subject to an additional tax on the supply of fossil fuels, via the Carbon Price Support (CPS) rates of the Climate Change Levy (CCL) (which is also known as the Carbon Price Floor).

There are clearly a number of policies in place to support offshore wind and to help deliver the green targets. There is only a limited budget available to support new renewable projects, commissioning before 2020, via the CfD regime (and for a few more years, the RO) and currently no budget certainty beyond this horizon. However, it is evident that these policies do create a market for offshore wind investment and we consider that this condition is met.

#### 6.5.1.3. Barriers to investment

Despite the policy interventions to support offshore wind, the results from our survey clearly indicate that barriers to investment remain, albeit that at least some of them are arguably less of an issue now than they were in 2012, and the relative importance of the types of barrier has also changed somewhat. As discussed above in section 6.3.1.1, technology risk, regulation and a lack of liquidity are the top 3 barriers to investment that respondents identified over the next five years.

One possible option to overcome these barriers might be simply to increase the support level for offshore wind provided under the RO, or (because CfD support levels are determined by a competitive process) to increase the overall budget available to all projects. By increasing the support for all projects (or the likely clearing price for all projects) this would have the effect of increasing the revenues of offshore wind generators, to further offset the risks investors face. However, this approach would in many cases end up providing additional subsidy to projects that would already have gone ahead without the additional support. This would impose higher costs on consumers and result in a greater transfer from consumers to offshore wind investors. Another alternative might be to have specific funding available for first-of-a-kind or pilot projects using new technologies.



The aim in employing GIB would be that through the combination of its targeted approach (focusing on individual projects at the margin of being financed on commercial terms), and its specialist knowledge and understanding of specific risks and technologies in the sector, it would be able to identify those projects on the cusp of being affordable within CfD budget rounds, provided the right financing and risk-sharing arrangements could be found. GIB might then help to ensure such projects were affordable, or help to develop financing arrangements for such projects that would suit the new support regime.

Based on the evidence we have gathered in this study we consider that there still are barriers to investment in the offshore wind sector and that this condition is met. It is important to consider, however, to what extent GIB would be able to ameliorate the (perceived) increase in regulatory risks associated with uncertainties about whether a project will be able to secure a CfD contract in the context of competitive allocation – or how GIB might support projects once they have secured a CfD.

## **6.5.2. Non-domestic Energy Efficiency**

### **6.5.2.1. UK green targets in place**

The UK's headline targets for energy efficiency are related to the final consumption of energy across the whole economy, although to some extent these are broken down into objectives amongst domestic energy users and non-domestic, business users. The EU 2020 objective is to reduce energy consumption by 20 per cent relative to the trajectory of “business as usual” levels in 2007. To support this aim the UK has set out an “indicative” target to reduce its energy consumption by 18 per cent. This target is not legally binding at the national level and therefore arguably is less credible than other EU climate and energy ambitions.

The UK renewable energy target, described in the offshore wind section above, also indirectly provides a target to implement energy efficiency measures. In order to achieve the renewables target, expressed as a share of renewables in final energy consumption, the government can either increase the supply of renewables, or decrease the demand for energy, or, as is the case in practice, seek to implement a combination of the two.

We consider that there are sufficient government targets in place for this condition to be met.

### **6.5.2.2. Policy in place**

Businesses are required to pay the CCL, which is a tax on their electricity consumption. This is in place to increase the price of electricity and incentivise firms to implement measures to reduce consumption. Many sectors, particularly those with relatively large electricity bills, have signed Climate Change Agreements (CCAs) with the government which exempt them from most of the CCL (currently businesses with CCAs only pay 10 per cent of the CCL) in exchange for committing to implement a programme of energy efficiency measures.

The EU ETS provides further incentives to large, energy intensive installations, which are covered by the scheme to reduce energy use, to the extent that this is tied to the level of emissions. It also provides indirect incentives to all electricity users (domestic and non-domestic) because the carbon price associated with electricity generation tends to be passed through to end users, making their bills more expensive.

Large electricity users (consuming over 6 GWh a year) that are not covered by either CCAs or the EU ETS are covered by the Climate Reduction Commitment (CRC) Energy Efficiency Scheme. This requires qualifying companies to monitor and report their energy use and to purchase allowances for the emissions that correspond to their energy consumption. The Energy Saving Opportunity Scheme also imposes requirements for mandatory energy audits.

Other government policies to encourage energy efficiency improvements for businesses include various mechanisms to pay (and account) for energy efficiency measures in an attractive way. These include the Green Deal, enhanced capital allowances, interest free loans made available to the public sector via Salix Finance and grant funding from central government for specific measures (e.g. the Department for Transport Local highways maintenance challenge specifically funded street lighting transactions with local authorities). The sheer number of different policy mechanisms to promote energy efficiency and, in some cases, the fact that they overlap with one another makes it a particularly complex policy landscape. It is also not clear, based on the rate at which GIB has been able to deploy funds in the sector, our survey evidence, and the follow-up interviews that we conducted as part of this study, that the existing policy support is sufficient to incentivise the uptake of energy efficiency measures, even with the participation of GIB (and other organisations) to help overcome market failures, such as information asymmetries. We would therefore consider that improved policy measures may be required to satisfy this condition, especially if GIB is restricted from offering forms of concessionary finance into the market.

#### 6.5.2.3. Barriers to investment

There is strong evidence that there are material barriers to investment in the non-domestic energy efficiency market. This is not only driven by the complexity of the policy and regulatory environment, but as our survey results suggest, both the lack of available transaction structures and standardised products, as well as the diffuse (and diverse) nature of the market mean that there is a lack of private capital investment. These findings were corroborated by our follow-up interviews, which indicated that GIB may need to take on greater risk, or seek lower returns than commercial banks, in order to stimulate investment. We consider that this condition is met.

### 6.5.3. Energy storage

#### 6.5.3.1. UK green targets in place

Energy storage is a catchall that could be applied to a very wide group of technologies; here we take it to refer to technologies that can easily store “excess” electrical energy and convert it back to electricity easily when needed. Although batteries and other technologies that can do this are hardly new, a competitive and compact technology that provides the necessary energy density, flexibility, and cost characteristics remains out of reach. Currently there are no explicit targets in the UK that set out how much storage capacity should be developed over the next decade. Energy storage capacity, however, can indirectly help the government to achieve its renewable energy objectives by storing cheap excess electricity produced when intermittent renewable output is high (high winds, or levels of solar radiation) and releasing the electricity at times of peak demand or when intermittent output is low. Storage can also meet the needs of the new capacity market. In both cases, storage capacity can reduce system balancing costs in the electricity network.

We consider that there is likely to be an increased role for energy storage to play as intermittent renewable technologies make up a larger share of the capacity on the electricity network. Whilst this condition for GIB intervention in the sector may not be fully met now, it appears likely that the need for storage will become an increasingly important aspect of delivering both renewable energy targets and maintaining security of supply in the near future. Viewed from a more market-based perspective, the value of storage is likely to increase over time, and its costs are likely to continue to decline, so that storage technologies may become more attractive investment prospects in future, even without explicit storage targets.

#### 6.5.3.2. Policy in place

The only direct government support in place to incentivise energy storage is via the UK's Capacity Market, which was recently implemented as part of the process of Electricity Market Reform. Electricity storage is able to compete, at auction, for capacity payments, along with other generation technologies and demand side response offerings. However, in the first Capacity Market auction, which took place in December 2014, energy storage made up just 5 per cent of the total capacity that was awarded contracts, and these were conventional pumped storage hydro facilities. The low clearing price of the auction meant that more immature storage technologies were not supported.

As the government does not have any policy in place to provide subsidies to emerging energy storage technologies that would bring them close to being investable, it does not appear that this sector currently meets this condition for GIB intervention. Of course if the economic case for investment is met without government support for certain projects then there could be a role for GIB to intervene.

#### 6.5.3.3. Barriers to investment

As noted above, there is a lack of policy and regulatory support for energy storage, which is evidently a key barrier to investment. Many storage technology types are at an early stage in their development and are largely unproven, at least at scale. Survey respondents and those that we discussed storage with in our interviews all indicated that the sector was still not "investment-ready", at least at a commercial level, and whilst developing the technology was the main focus, other barriers were generally associated with the immaturity of the market and a lack of transaction structures.

We therefore consider that there are major barriers to investment – all of the barriers that we highlight in this study are present to some degree – and that this condition for GIB intervention is met.

### 6.5.4. CCS

#### 6.5.4.1. UK green targets in place

CCS can help reduce emissions in both electricity generation and for industrial emitters. Government targets in this area to decarbonise are clearly established both at the EU level, with defined targets to cut overall emission levels for 2020 and 2030, and continuing ambitions going out as far as 2050. Similarly the UK has its own targets, set in the Carbon Budgets.

The government expects that CCS will play a role in delivering decarbonisation across the economy. Demonstration projects are currently in the pipeline, and government forecasts suggest that the technology will be operational, at least in the electricity generation sector, during the 2020s. We therefore consider that this condition is met, but acknowledge that it may still be too early for GIB's intervention in the market, the timing of which will largely depend on when the first full scale projects come to the market and receive government support.

#### 6.5.4.2. Policy in place

The CfD regime that has been recently launched in the UK covers all types of low-carbon generation technologies, and thus is expected to include CCS and nuclear. CCS does not currently qualify for support and the government has not explicitly set out a budget to support CCS as it has done for other renewable technologies. However, the government has made it clear that it intends to support CCS projects via bilaterally negotiated CfD contracts. This would be similar in approach to the CfD contract the government agreed with EDF Energy for the Hinkley Point C nuclear project in 2013.

CCS is also supported indirectly by other policies that apply a price to carbon, such as the EU ETS scheme in the EU and the CPS rates of CCL in the UK (for which CCS generators will only pay "abated" CPS rates of CCL).<sup>60</sup> We consider that the policy framework is in place to satisfy this condition, but that there will only be a clear role for GIB intervention once a project agrees a CfD with the government, and at that point will be looking for investors to support the project. (GIB's role in such a project would be somewhat uncertain, however, subject as it would be to bilateral negotiation with the government.)

#### 6.5.4.3. Barriers to investment

CCS projects are typically large scale and, at least while the technology remains expensive, there are unlikely to be many installations fitted with CCS. This feature of the market itself will limit the number of investors that are likely to take an interest in investing in CCS projects, outside of the group of project developers due to the fixed costs associated with understanding the technology and the particular transaction risks.

Our survey respondents indicated that there are barriers to investment in CCS that provide a case for GIB intervention. One of GIB's successes in offshore wind that this study has identified is the reputation it has earned for understanding the regulatory and technology risks of a project and providing a degree of reassurance to co-investors that makes them more comfortable participating in the transaction. One of the messages from our interviews with government staff and some investors was that GIB could usefully play a similar role in facilitating access for private capital to flow into CCS transactions.

We consider that this condition for GIB intervention is met.

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<sup>60</sup> In the context of the CfD regime the EU ETS and CPS primarily serve to increase the budget available to CfD-supported capacity.

### **6.5.5. Wave and tidal**

#### **6.5.5.1. UK green targets in place**

The UK is regarded as an excellent location for wave and tidal stream electricity generation, and these are another group of technologies that the government regards as having the potential to help deliver low-carbon electricity both by 2020 and afterwards. The relevant targets are therefore the same ones that are relevant to offshore wind and CCS, namely the 2020 renewable energy targets and decarbonisation targets at both the EU and UK level that extend beyond 2020. The government has stated in its Renewable Energy Roadmap that between 200 and 300 MW of capacity could be deployed by 2020, with the potential for significantly more capacity in the decades that follow.

We consider that there are clear green targets that wave and tidal generation can help meet, but as in the case of CCS, acknowledge that significant deployment of wave and tidal is unlikely to be necessary until into the 2020s.

#### **6.5.5.2. Policy in place**

The policy framework in place for wave and tidal electricity generation is similar to that of offshore wind. In addition to the carbon prices which improve the competitiveness of renewable generators, wave and tidal projects can currently seek support under the RO as well as the CfD regime. In the first CfD allocation round, which concluded in the first quarter of 2015, a minimum capacity was made available to support wave and tidal generation at the maximum strike price (i.e. without going to auction) although this was not taken up. In addition, the government is currently in talks to negotiate a CfD contract for the Swansea Bay Tidal Lagoon project, outside of the standard CfD allocation round. If this contract is agreed, there may be a role for GIB to participate in this transaction if the project is unable to attract sufficient investment itself due to the risks around the project and the absence of a track record. As for CCS, the participation of GIB in a bilaterally negotiated government contract would be a new development.

We consider that this condition is met, although there is unlikely to be an extensive pipeline of projects and transactions for GIB to involve itself in the near future.

#### **6.5.5.3. Barriers to investment**

The barriers to investment in wave and tidal are predominantly around the immaturity of the technology, which is at an early stage of development, not just in the UK, but internationally. This means that it is difficult for investors to fully understand, and price, the risks involved in the project. They are also long term projects (the projected lifespan of the Swansea Tidal Lagoon, for example, is 120 years), which may only attract certain types of investors and require specific structures incorporated into the transaction.

Although it is a barrier to investment, the immaturity of the technology itself does not necessarily mean that there is an inherent market failure for GIB to help address. It may simply be the case that the risks of investing in an unproven technology are too great to justify the potential rewards. However, given the resource potential in the UK, it appears likely that there will be positive spillover effects of investing in the initial projects that will serve to decrease the cost of future projects through learning. We consider that there are

sufficient barriers to investment, grounded in market failures, to justify a role for GIB in encouraging capital flows into the sector, but note that the need for this intervention will be governed by the pipeline of projects that is able to agree on terms for policy support with the government.

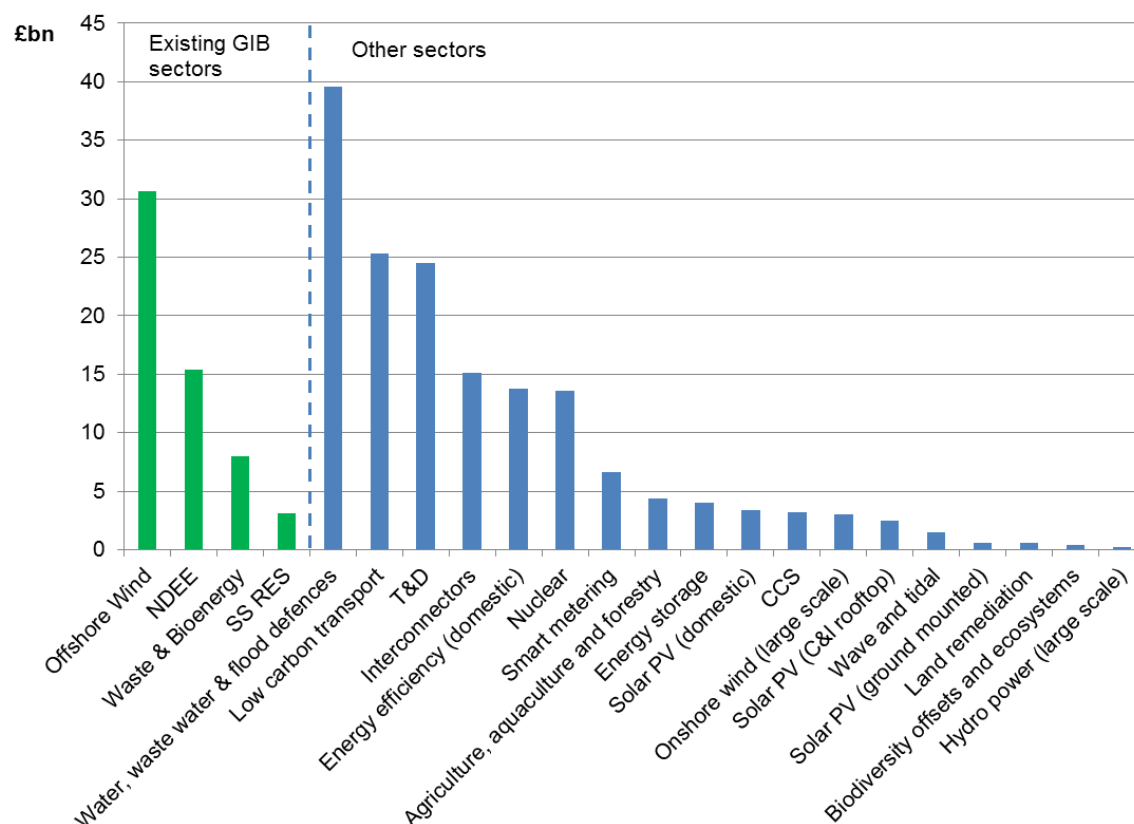
## **6.6. Prioritisation of Sectors**

The final stage of our framework for evaluating the need for GIB intervention is to prioritise the sectors that meet our conditions according to survey analysis of market participants, a quantification of the scale of the funding required and analysis of the extent to which this magnitude of investment constitutes a step change from historic investment into the sector.

### **6.6.1. Funding requirements**

Figure 6.8 shows estimates of capital requirements over the period from 2015 to 2020 across GIB's existing four core sectors and the additional (non-core) seventeen sectors that we identified above (in section 6.2.1). This is largely based on publicly available data and made up of both bottom-up (where sufficient data was available) and top-down assessments of investment needs in all of the sectors listed above in Table 6.1. As part of this study we have not carried out a detailed bottom-up review of the funding requirements for all of the sectors. However, we have been able to draw on contributions from GIB and Government departments to provide a tentative illustration of the likely order of magnitude of the capital needs across the different sectors of the green economy.

**Figure 6.8**  
**Estimated Capital Requirements of "Green" Sectors Over Next 6 Years (2015-2020)**



Sources and Notes:

OSW, W&B and all other renewable electricity estimates are based on National Grid capacity forecasts (and GIB data for waste arisings), assumptions regarding which projects will be financed by the end of 2020, and capex assumptions based on both DECC and GIB in-house sources. Nuclear and CCS estimates are based on project-level capex estimates and assumptions regarding the extent of capital deployment by 2020.

NDEE estimates include deployment forecasts for building retrofits (drawing on NHS and Carbon Trust data), industrial energy efficiency (analysis based on energy use, potential savings and payback time), renewable heat (DECC forecasts extrapolated beyond 2016), CHP and stand-alone heat networks (DECC forecast) and street lighting (analysis based on fixed cost estimates and the number of street lights).

Energy storage and interconnector estimates are based on the pipeline of projects until the end of the decade. Smart meter capital requirements are based on DECC's impact assessment for the roll-out across the UK. Transmission and distribution (T&D) capital requirements are based on network operator business plans and Ofgem publications.

Low carbon transport estimates are broken down into a number of different categories covering, for example, electric vehicles (Office for Low Emission Vehicles forecasts), charging infrastructure (Vivid Economics analysis for GIB), rolling stock (rolling stock operating company publications); network electrification (High Level Output Specification for the Office of Rail Regulation), and other, smaller sub-sectors.

Water and waste water estimates are based on information included in the recent pricing review (PR14) conducted by Ofwat; flood defence capital requirements are based on analysis by the Environment Agency.

All other figures are estimates made both at the individual project level and drawing on top-down analysis in documents published by government departments and regulators (e.g. Defra, Environment Agency, Ofgem).

The green bars in Figure 6.8 represent the sectors that GIB is already active in, with the additional sectors also considered as part of our review in blue bars. These results clearly show that there are still very significant investment needs in the offshore wind sector, as well

as in the other current GIB sectors. The offshore wind, waste & bioenergy and non-domestic energy efficiency sectors all have large estimated capital requirements over the next six years, although they are not the largest when compared to other “green” sectors. Of these, water (including waste water and flood defences) is the largest.

Almost £30 billion of the £34 billion total estimated for this category is investment in the water and wastewater network infrastructure based on Ofwat assumptions in the most recent pricing review. Whilst this is clearly a sizeable amount over the next six years, it is important to note that the water companies themselves are likely to be able to deliver a significant share of this (and possibly all of it), so the gap to be filled from outside investors may not be very high. Similarly investment requirements in the transmission and distribution grid, as well as in interconnector capacity, are some of the highest across the sectors shown, but investment levels in these sectors have tended to be high in the past (albeit that such investments tend to be cyclical), meaning that the role for GIB in bringing additional investors into the sector may be limited. Finally, low carbon transport is another sector with notably high investment requirements. One reason for this is that, in categorising the sector at this level, we have aggregated a number of sub-sectors together, including the likes of rolling stock, network electrification, charging infrastructure for electric vehicles, green buses, both private and commercial electric vehicles and sulphur scrubbing. Of these sub-sectors network electrification (£6 billion), rolling stock investments (£5 billion) and commercial electric vehicle fleets (£3 billion) are the largest single items.

### 6.6.2. Funding gap

As noted above, we have not carried out a detailed quantification of the funding *gap*, relative to historic investment trends in this study, although this would be an informative complement to the data shown in Figure 6.8. We do, however, briefly discuss the potential funding gap for a few sectors in the following paragraphs and highlight how this is likely to vary across sectors.

The funding requirement for offshore wind over the next five years is estimated to be approximately £30 billion (see Figure 6.8 above). Our survey responses and follow-up interviews have consistently indicated that the biggest need for capital in the sector currently is for equity at the development and construction stage of projects. If we assume that in a typical project the developer finances 70 per cent of the costs via debt and the remaining 30 per cent through equity, then the equity proportion of the total funding requirement is £30 billion, multiplied by 30 per cent, which is equal to £9 billion. Assuming a project developer typically looks to provide half of this equity itself and seeks external finance for the remaining 50 per cent of the equity, then this would imply that other investors are needed to fill a gap of approximately £4.5 billion over the next six years. This is a very simple illustration, but it highlights that, even if project developers are able to meet approximately 85 per cent of the investment needs in offshore wind, there is still a sizeable gap in the market. GIB has invested just short of £1 billion as equity in projects, mobilising a further £2.5 billion of private sector capital, since it began operations in 2012.<sup>61</sup>

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<sup>61</sup> This example is intended to highlight how one might go about carrying out a more detailed assessment of the funding gap for different sectors. It should be treated as an illustration and, as such, relies on approximate assumptions that are



With regard to the funding gap it is important to note that the structure of certain sectors (including their regulatory environment) will strongly influence the extent to which capital is readily available to develop new projects. Highly regulated sectors and those dominated by well-established companies, with large balance sheets and a track record of delivering infrastructure projects, are likely to meet the capital requirements more readily without GIB intervention. For example, T&D networks are run by a handful of large network operators whose returns are heavily regulated, providing a relatively stable revenue stream that is attractive to investors such as pension funds. Similarly, the majority of planned interconnection projects are due to be delivered by National Grid<sup>62</sup>, which is likely to be able to meet these investment requirements without relying on the intervention of GIB. And, as noted above, a very large proportion of the required investment in the water sector is expected to be met by the regulated water companies who, like electricity network operators and National Grid, are regulated companies with sufficient balance sheets and a track record of large investments, which should enable them to meet the investment challenge.

This contrasts sharply with the funding gap for other, less mature sectors, such as agriculture, aquaculture, forestry, land remediation and biodiversity and ecosystem services, which do not have a track record of delivering significant investments and lack the regulatory environment at present to offer an attractive destination for capital flows. In such cases the funding *gap* is likely to be of a similar magnitude to the funding requirements set out above in Figure 6.8.

Instead of a detailed analysis of the funding gap in each sector, we have presented the results from our survey which rank sectors according to the respondents' assessment of the need for GIB intervention, which were originally shown above in Figure 6.6. Figure 6.9 shows a comparison of the market sizing estimates for the next six years and the survey responses regarding whether or not the respondent believed there was a need for GIB intervention. To depict the comparison more clearly we have adjusted the scores of the survey response such that the sectors that had the lowest scores (domestic and ground mounted solar PV) are assumed to have a score of zero (rather than a negative score) and all other scores are positive.<sup>63</sup>

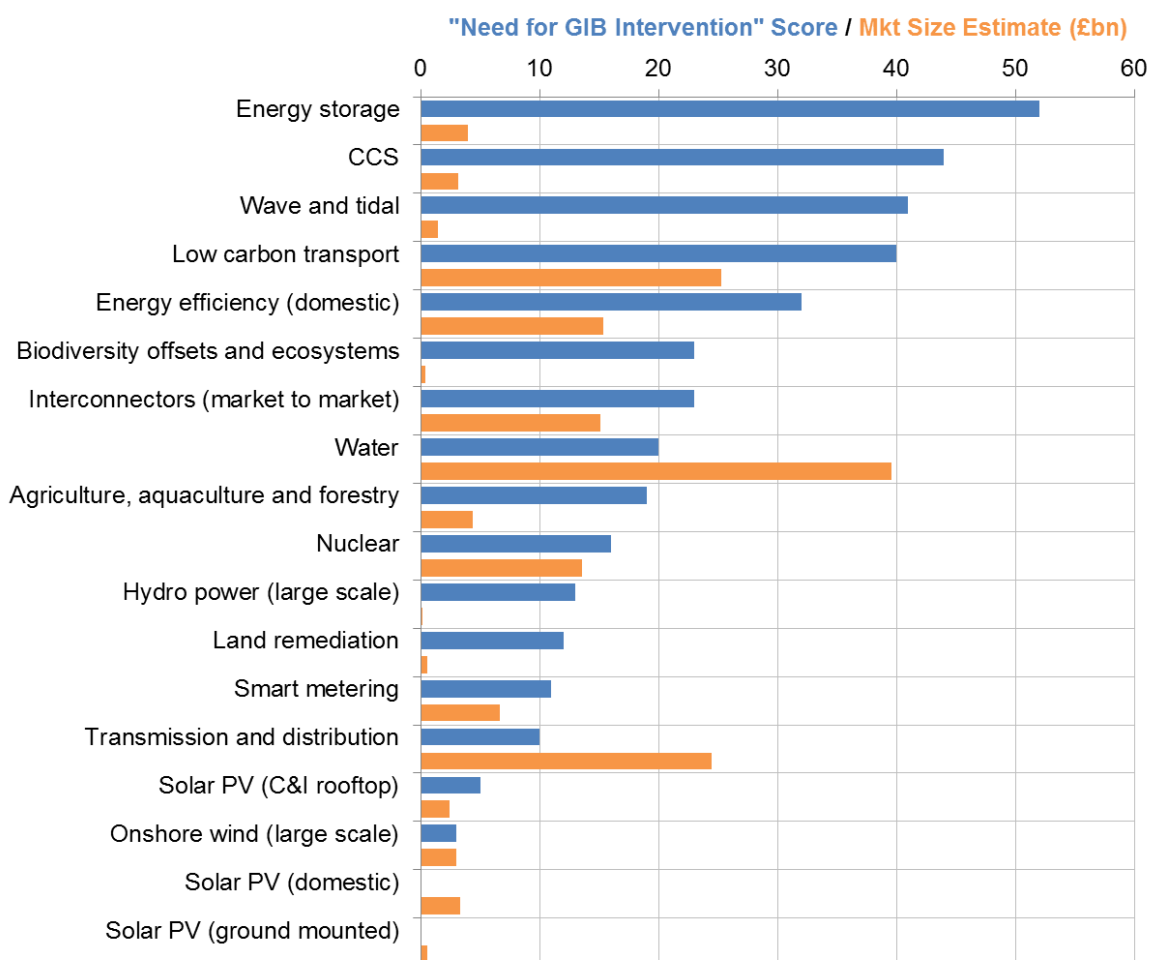
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informed by our knowledge of past transactions in the offshore wind sector, but which may not necessarily hold in the future. The extent to which project developers are able to meet a substantial part of the investment requirements in offshore wind will depend on a number of factors, including their ability to refinance their investments once they reach the late construction or operational stages of development.

<sup>62</sup> We are aware of two interconnector projects that are being developed by other private companies (not the National Grid). These projects account for a relatively small amount of the total investment to 2020, but given that National Grid has been the sole project developer to date, they may benefit from GIB intervention to attract sufficient private capital.

<sup>63</sup> As noted above, the original score was calculated by assigning a (positive) point to a sector if a respondent stated there is a need for GIB intervention and a negative point where a respondent stated there was not a need for GIB intervention. This produces negative (net) scores for several sectors, the lowest being -24 for both domestic and ground mounted solar PV. The adjusted score for each sector presented here is calculated by simply adding 24 to all of the original scores to ensure they are all positive or zero, whilst preserving the difference in score between sectors.

**Figure 6.9**  
**Comparison of Survey Score and Estimated Capital Requirements**



Source: NERA Survey and data shown in Figure 6.8 above.

Low carbon transport and domestic energy efficiency both score relatively highly on both measures. In general, however, this comparison shows a fairly limited correlation between the sectors that survey respondents felt were in need of GIB intervention and the estimated capital requirements for the next six years. There are various possible explanations for this, which we have touched on already above:

- Some sectors comprise significant sub-sectors which could be considered in their own rights, and which do not all necessarily present a need for GIB intervention (e.g. water and low carbon transport);
- Whilst the capital requirements are high, respondents may not have felt that there were significant barriers to achieving the required investment levels. This might be because either the investment levels today are already very high, so the funding “gap” relative to historic trends is not so great. Alternatively it might be because regulation is in place which makes it likely that the sector will attract sufficient funding without the additional support of GIB (e.g. Transmission and distribution and the various types of solar PV);

- And finally it is worth noting that the estimated capital requirements are over the next five years. It may be the case that respondents were considering a longer timeframe when opining on whether or not there was a case for GIB intervention (e.g. CCS, wave and tidal), which may explain why the two measures are not so aligned.

Incorporating analysis of the funding gap, relative to historic investment trends, into this comparison may be informative and provide a clearer picture. There may also be additional features of these sectors, which this framework does not fully consider, which better explain why market participants have highlighted that the greatest need for GIB is in sectors with relatively low capital requirements. For instance, both CCS and tidal projects are typically large and there are not expected to be a large number of them. This in itself may limit the pool of investors that are interested in the sector and provide a role for GIB to commit resources to fully understanding the risks involved and to lend support in bringing in co-investors to help close these transactions. It may also be because certain of these sectors, such as CCS, carry a high level of regulatory dependency. Respondents may have recognised that these are immature sectors which will require government intervention, and anticipate that GIB will be a first mover once the regulatory or incentive frameworks are put in place.

## 6.7. GIB Product Offerings

### 6.7.1. Range of Existing Products

As already discussed in detail in previous chapters, in pursuing its mandate to boost investment in the UK's green economy, GIB has deployed a number of different products.

On the one hand, GIB has made various direct investments covering both the construction and operational stages of projects. During construction, GIB has provided senior debt alongside other banks, but also equity and, occasionally, small tranches of subordinated debt (in W&B). The choice between these instruments has mostly been driven by the individual needs of each project, i.e., by whether the perceived capital shortfall affected more the debt or the equity side of the transaction. Likewise, GIB has invested both debt and equity in operational projects in the OSW sector. Both types of investment have provided capital recycling routes for early-stage investors, freeing up capital for reinvestment in new assets and increasing confidence in the liquidity of the refinancing market. Taking equity stakes in operational projects has also allowed GIB to build a portfolio for its Offshore Wind Fund.

Yet, GIB's direct offerings to projects have not been comprehensive. GIB has refrained from taking any pre-construction or development risk. Also, in keeping with its founding principles (and State Aid requirements), GIB has not provided any concessionary financing. Safeguards against the latter include the requirement for GIB to find private investors who invest alongside it on the same terms.<sup>64</sup> Similarly, GIB has not been involved in any credit enhancement activities such as acting as a formal guarantor of debt or taking substantial "first-loss" tranches (junior debt or mezzanine capital), a role that other development banks such as EIB have played and that the HM Treasury-run Infrastructure UK division has also filled, to some extent. It also does not currently invest in demonstration projects or provide technical assistance.

On the other hand, GIB has made extensive investments through funds, the main goal of which has been the aggregation of investment opportunities, relying on the expertise of specialised fund managers. These funds have taken both equity and debt positions in projects. To ensure that this happens on commercial terms, GIB has insisted that the co-investment from other investors at least matches GIB's investment, usually through a parallel fund managed by the same fund manager. However, GIB has not invested in any "layered" structures to date, where different groups of investors enjoy different levels of seniority.<sup>65</sup> At the same time, it has recently begun acting as a fund manager itself, through the creation of its Offshore Wind Fund, which is managed by a wholly owned subsidiary UK Green Investment Bank Financial Services.

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<sup>64</sup> In those cases where there has not been a co-investor, as, for example, in the Sheringham Shoal and Gwynt y Mor transactions in the OSW sector, GIB asked an external expert to confirm the non-concessionary nature of the transaction in an MEIP (market economy investor principle) report.

<sup>65</sup> This is viewed by some as a promising tool to boost private investment in the green economy by catering to different risk appetites within a single structure. Public and semi-public entities like the GIB would be expected to take the most junior positions improving the risk-return profile for private investors. See OECD, Public Financial Institutions and the Low-carbon Transition, OECD Environment Working Paper, 2014 for further discussion of this issue.

## 6.7.2. International Comparison of Product Offerings in the Green Economy

As part of our assessment of GIB's product offering, we carried out a review of other "green development banks", i.e., public financial institutions with at least a partial focus on the green economy (renewable energy, energy efficiency, low-carbon transport, ... etc.) in order to compare them with GIB and to determine if there are any lessons to be learnt in relation to GIB's future product offering. While GIB was created "from scratch" in 2012, some green banks considered here date back as far as the 19<sup>th</sup> century, with their roots in traditional infrastructure financing.<sup>66</sup> Other institutions, in contrast, are even younger than GIB, for example, the Australian Clean Energy Finance Corporation only started operating in 2013 and a host of state-level green development banks have been set up in the US over the last couple of years.

### 6.7.2.1. Comparing product offerings

Table 6.6 below summarises GIB's current product offering and compares it to that of other leading public financial institutions with at least a partial green focus, namely, Kreditanstalt für Wiederaufbau (KfW) from Germany, Caisse des Dépôts et Consignations (CDC) from France, the European Investment Bank (EIB), and the Australian Clean Energy Finance Corporation (CEFC). We also include a brief discussion of the recent emergence of state-backed green development banks in the US as well as in other countries.

KfW was founded in 1948 and is headquartered in Frankfurt am Main, Germany. It is a corporation under public law which is fully owned by the Federal Republic of Germany and its member states. At the end of 2014, KfW's balance sheet stood at €489 billion. Next to domestic promotion, in particular the promotion of energy efficiency across all sectors of the German economy (households, businesses, public sector), KfW engages in export and project finance, which includes the financing of OSW and other renewable energy assets, as well as development finance. A main source of funding for KfW's activities are bonds guaranteed by the German federation (helping to keep KfW's funding costs low), but also capital allocations from the federal budget, with the German government relying on KfW to implement various public investment programmes and related initiatives.<sup>67</sup> Since 2009, KfW has committed between €20 billion and €30 billion each year to environmental and climate protection representing between 30 and 40 per cent of its total new business volume.<sup>68</sup>

The CDC is a French institution headquartered in Paris, which dates back to 1816. It was established as an institution under French public law, with no shareholders. Its role and structure differs somewhat from the other green banks that we reviewed, most importantly with respect to its funding. CDC manages large amounts of savings accounts held by the general public and public or semi-public pensions and solidarity plans. The total value of savings held by CDC was €262 billion in 2014. CDC engages in two types of investment,

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<sup>66</sup> Whilst these older institutions have not been involved in the green economy for their entire lifetimes, their established history and expertise mean they already had much of the internal infrastructure, processes and reputation in place to transfer across to green sectors.

<sup>67</sup> OECD, Public Financial Institutions and the Low-carbon Transition, OECD Environment Working Paper, 2014

<sup>68</sup> KfW, Sustainability Report – Facts and Figures Update, 2014.)

namely, “public-interest investment” in regional development and social housing and SMEs and “long-term financial investment” in listed companies, real estate, private equity and infrastructure. Investment in the latter happens, for example, through its subsidiary CDC Infrastructure. Around 15 per cent of CDC’s investment has been directed towards the green economy (renewable energy, energy efficiency, low-carbon transport) in recent years.<sup>69</sup>

The EIB was established in 1958 under the Treaty of Rome and is headquartered in Luxembourg with a balance sheet of €542 billion in 2014. It is wholly owned by the 28 member states of the European Union. Together with the much smaller European Investment Fund, which specialises in SME and venture capital financing, it forms the EIB Group. Current sources of external funding include the international capital markets (EIB has become a major player in the emerging green bond market) as well as EIB’s subscribed capital, only a fraction of which has been called up to date. In 2014, the group invested around €80 billion, of which €21 billion was directed towards infrastructure (30 per cent, or approximately €7 billion of this, was provided to support the development of renewable energy projects) and a further €19 billion was channelled to so-called “climate action”. The share of new investment committed to green purposes is therefore around 30 per cent implying an increase on the 20 - 24 per cent reported for the years 2010 – 2012.<sup>70</sup>

The Australian CEFC is a more recent example of a dedicated green bank. Similar to GIB, all of its investments are channelled into the green sector although, unlike GIB’s current narrow focus on a small number of sectors, the bank’s mandate covers a long list of sectors and technologies, spanning the breadth of the green economy. There are currently changes being proposed to reduce the size of this mandate.<sup>71</sup> It is also able to provide corporate loans tied to green investments, as an alternative to direct investments in projects. CEFC was set up in 2013 with an expected capital commitment of AUD\$10 billion (approximately £5 billion) to cover the period from 2013 to 2017. It is fully owned by the Federal Government of Australia and is based in Sydney. To date it has deployed over AUD\$1.4 billion across more than 55 direct investments (and an additional 34 projects co-financed under aggregation programs), mobilising around AUD\$2.1 billion of additional capital at a mobilisation rate of approximately 1.5.<sup>72</sup> This is an even larger number of projects than GIB has been involved in to date, although represents less than half of the value of investments made, implying that GIB has been involved in fewer, but larger investments than the CEFC. There are currently limited constraints around where the CEFC deploys its capital across green technologies, but the investment strategy target for 2018 (once the initial AUD\$10 billion has been deployed)

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<sup>69</sup> Cochran et al, Public Financial Institutions and the Low-carbon Transition, OECD Environment Working Paper, 2014. This figure excludes the investment activity of CDC Infrastructure, which has invested, for example, in OSW projects in Germany.

<sup>70</sup> Cochran et al, Public Financial Institutions and the Low-carbon Transition, OECD Environment Working Paper, 2014. This figure appears to cover EIB only and only looks at sustainable transport, renewable energy and energy efficiency investments.

<sup>71</sup> For example, the federal government of Australia recently ordered the CEFC not to make any further investments in onshore wind projects.

<sup>72</sup> Based on a CEFC statement dated 13 July 2015, available online here: <http://www.cleanenergyfinancecorp.com.au/media/releases-and-announcements/files/statement-from-the-cefc.aspx>. Note that the mobilisation rate of approximately 1.5 is considerably lower than GIB’s average mobilisation rate of 3.5. We have not investigated potential reasons for the difference.

is for 50 per cent of the capital to be directed to renewable technologies and the other 50 per cent invested in low emissions technologies and energy efficiency projects.

**Table 6.6: Current GIB Product Offering and International Comparison**

Institution:	UK GIB	KfW	CDC	EIB	CEFC
<b>Funding and green focus</b>					
<b>Shareholders</b>	National government	Federal and state governments	None	National governments of EU 28	Federal government
<b>Current sources of funding</b>	Shareholder capital	Bond market; national budget	Bond market; savings deposits	Shareholder capital; bond market	Shareholder capital
<b>Capital committed to green sectors (new business)</b>	100%	35% - 40%	15%-20%	25%	100%
<b>Direct investment</b>					
<b>Development stage</b>	No	No	No	No	Yes
<b>Construction stage</b>	Debt and equity	Debt	Debt; equity limited to SMEs	Debt; equity via EIF	Mainly debt
<b>Operational stage</b>	Debt and equity	No	Equity via CDC Infra-structure	Debt; equity via EIF	Mainly debt
<b>At market rates</b>	Yes	Yes	No	No	Yes
<b>Concessionary finance</b>	No	Yes	Yes	Yes	Limited
<b>Credit enhancement</b>	No	Yes	No	Yes	No
<b>Technical assistance</b>	No	Yes	Yes	Yes	No
<b>Demonstration projects</b>	No	No	No	No	Yes
<b>Intermediated lending</b>	No	Yes	No	Yes	No
<b>Lending to households</b>	No	Yes	No	No	No
<b>Funds</b>					
<b>Fund investment</b>	Yes	Yes	Yes	Yes	Yes
<b>Layered funds</b>	No	No	No	Yes	No
<b>Fund management</b>	Yes	No	Yes	Yes	No

Source: Cochran et al, Public Financial Institutions and the Low-carbon Transition, OECD Environment Working Paper, 2014 and institutional websites.

Notes: “Green sectors” are defined as sustainable transport, renewable energy and energy efficiency. “Capital committed to green sectors” are NERA estimates based on Cochran et al (2014) and institutional websites.

As Table 6.6 reveals, GIB differs from other, older green banks in a number of ways. An obvious, yet important distinction is that GIB (as well as CEFC) exclusively focuses on the green economy. Another distinguishing feature of GIB is that it currently only invests at “market” rates. KfW lends “at market conditions”, for example, under its Offshore Wind Energy Programme providing construction-stage financing to OSW farms in German waters.<sup>73</sup> Likewise, the majority of the CEFC’s financing is also on commercial terms, making it the most closely aligned to GIB of the banks that we reviewed. However, aside from GIB, all of the other banks provide some “concessionary” products, either via taking on additional risk or offering lower interest rates than commercial banks are prepared to provide.

<sup>73</sup> KfW, Information Sheet Renewable Energy, KfW Offshore Wind Energy Programme, 2015.

Concessionary finance can take a number of forms. KfW and EIB mainly pass on the benefits of their strong credit ratings to recipients of their financing (bolstered, for example, in the case of KfW by a federal government guarantee), which means that it typically is able to lend at lower rates than commercial banks. Likewise, CDC has access to large and stable pools of relatively cheap funding, namely, the funds committed by households to national passbook savings accounts. Loans handed out by KfW and CDC may also contain a grant element financed by public funds as part of a dedicated programme agreed with government.<sup>74</sup> Similarly, the CEFC is able to provide a limited amount of soft (“concessional”) loans, or loans with a longer tenor than offered by the private sector. These loans are compared to market terms on a net present value (NPV) basis and, using this measure, are capped at a maximum of AUS\$300 million difference in NPV a year. To date the CEFC has only used this option in cases where a gap has been identified in the market, and has remained well short of the level of the cap.

Credit enhancement offerings also come in a variety of guises. EIB provides guarantees for projects pledging to pay off senior or subordinated debt in case of default. Also, to improve the quality of the senior debt issued by a project, EIB may itself provide a tranche of subordinated debt (“first-loss”), as it has, for example, done to support project bonds under the Europe 2020 Project Bond Initiative. KfW provides “loan guarantees” as part of its on-lending programmes with commercial banks.<sup>75</sup>

#### 6.7.2.2. An emerging trend of green development banks

In addition to the banks covered above, GIB appears to be part of an emerging trend of dedicated green development banks set up by national and state level governments. In the US the Connecticut Green Bank was established in 2011 and has been followed by other state institutions including the Vermont Sustainable Energy Loan Fund, the California Clean Energy Finance Center, the New Jersey Energy Resilience Bank and the New York Green Bank. These all act as delivery vehicles to assist government in achieving green ambitions, but differ in their approach. With the exception of the New York Green Bank all offer some form of concessionary finance or credit enhancement products such as loan guarantees or zero interest rate borrowing to develop immature green technologies. The New York Green Bank is closest to GIB in its approach of investing at “market rates”.

Further green banks are anticipated in the US, including a Rhode Island infrastructure bank and a green development bank in Maryland and there are also a number of such institutions set up at the country level. The Malaysian Green Technology Corporation, established in 2010, was actually one of the earliest of the recent wave of green banks. Other examples include the Technology Fund in Switzerland and the Green Fund in Japan. We have not reviewed the operations, financing and product offerings of these banks in great detail as part of this work. However, the recent emergence of dedicated green financial institutions, many of which were established at the same time or after GIB, suggests that a number of

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<sup>74</sup> Cochran et al, Public Financial Institutions and the Low-carbon Transition, OECD Environment Working Paper, 2014, p. 58.

<sup>75</sup> Cochran et al, Public Financial Institutions and the Low-carbon Transition, OECD Environment Working Paper, 2014, p. 65.



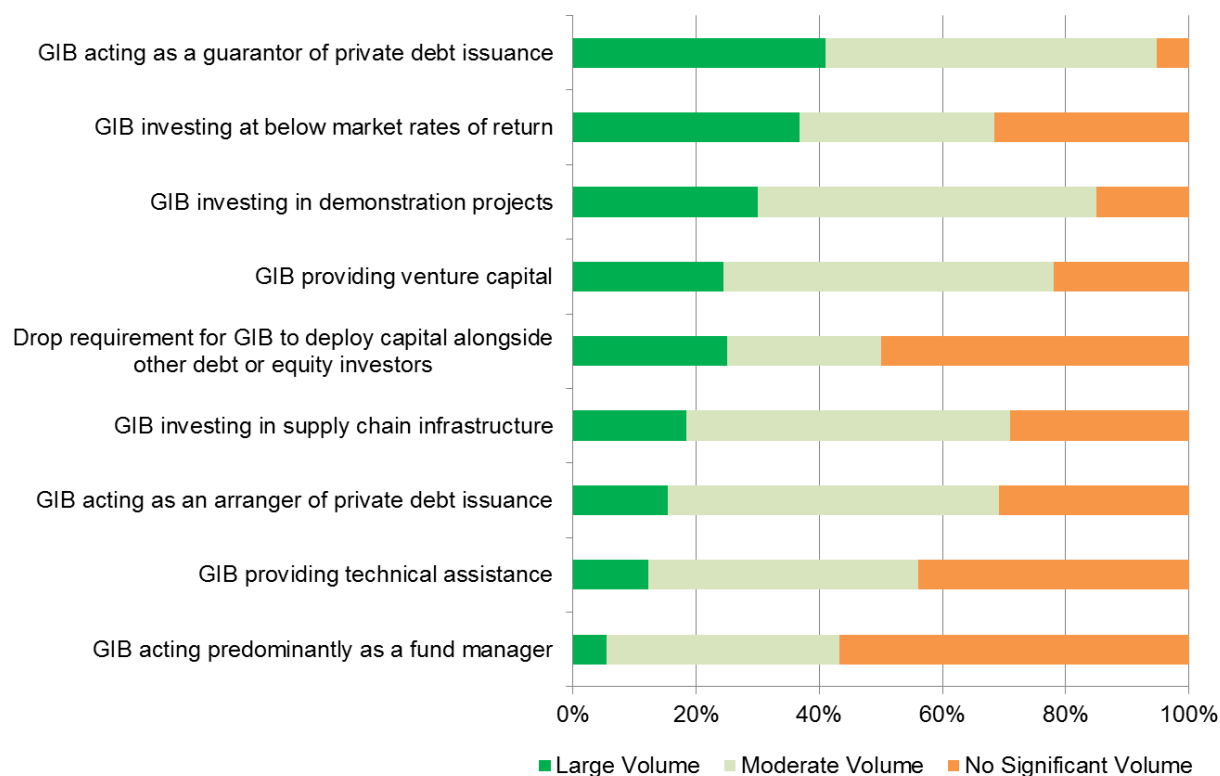
governments believe that these institutions can be useful policy instruments to stimulate investment across different areas of the green economy.

### 6.7.3. Potential to Expand Product Offering

Taking note of this cross-country heterogeneity, we have investigated options for GIB’s future product offerings. To evaluate GIBs current product range and assess future options, we have relied on our survey results and in-depth interviews with GIB staff, government departments, investors and wider stakeholders.

In our survey we provided a list of different “products” or approaches that GIB might offer in the future and asked the respondents to assess the extent to which they thought this might attract private capital flows into the UK’s green infrastructure. The question was posed without specific regard to a particular sector, but rather for the green economy as a whole. Figure 6.10 shows the list of options that we included in the survey question on the left hand side, with the bars depicting how much capital the approach would likely attract. We provided three options, which were a “large volume” (dark green), a “moderate volume” (light green), or “no significant volume” (orange). The “products” are ordered by the number of respondents that indicated the option would attract a large volume of capital. We did not offer any suggestion as to what “large” or “moderate” might mean in terms of a quantity of capital, but were instead interested in relative assessments among the different options. The structure of the question also did not allow for the possibility that any of the product offerings would *reduce* the amount of private capital that was attracted to the green economy.

**Figure 6.10**  
**Volume of Private Capital that would be Attracted if GIB Offered the Following Products (41 responses)**



Source: NERA survey

Many of the different product options elicited mixed reactions from our survey respondents. A role for GIB to act as a guarantor of private debt issuance came out as the option which respondents believed would attract the largest amount of capital to the sector, with over 40 per cent of respondents stating that it would attract a “large volume” of capital, and almost a further 44 per cent saying that it would attract a “moderate volume” of capital. GIB investing in demonstration projects appears to be the second best option in terms of attracting more capital, with 30 per cent saying that it would attract a “large volume” and a further 55 per cent indicating that it would attract a “moderate volume” of capital.

Respondents gave a largely negative assessment to GIB acting predominantly as a fund manager, with just 5 per cent suggesting that it might attract a “large volume” of capital, and more than half suggesting it would yield no significant additional capital. Similarly, approximately half of respondents thought that if GIB dropped the requirement to deploy capital alongside other debt or equity investors, this would not attract a significant volume of capital to the sector.

One notable result was that close to 40 per cent of respondents thought that if GIB were to invest at below market rates (which would be a significant departure from the existing principles of the bank) this would attract a “large volume” of capital, although over 30 per cent thought the opposite (that it would not attract any significant volumes of capital). Presumably those that thought this would be a good means to bring in private capital were assuming that GIB would take on a disproportionate amount of the project risks, making the investment more attractive to others, and not that others would participate on the same terms as GIB.

We also asked the survey respondents whether they thought that GIB had a role to play in developing the UK’s green bond market. Of the 36 survey respondents that answered this question, 16 indicated that they did think GIB has a role to play in the green bond market, and 20 stated that they did not think this was a potential role for GIB.

In our follow up interviews a number of market respondents have indicated a desire to see GIB expand its range of products, including the provision of credit enhancement products. As we have described above in section 6.3 the need for different products varies across sectors. The interview findings with regards to future product offerings can be summarised as:

- **OSW:** Market participants noted that there was now a need for GIB to focus its capital on construction stage assets, particularly in providing equity, which is in line with GIB’s stated and executed strategy. Some noted that in the next 5 years there was likely to be a role for GIB in committing capital (and encouraging others to co-invest) to projects with riskier technologies, such as the development of offshore wind farms in deeper waters.
- **W&B:** Several of those we talked to suggested that standard energy from waste projects no longer needed GIB intervention and that GIB would inevitably need to turn its attention both to understanding the risks of less-conventional technologies and to develop offerings to mitigate some of the risks around the security of feedstock supply to a project.
- **NDEE:** There was a broad consensus amongst those we discussed the sector with that GIB’s current offering had not yet delivered a material impact on the sector. A number of respondents felt that GIB would need to offer either some form of concessionary finance or credit enhancements to encourage uptake of energy efficiency measures. Others held

out hope that through the development of more standardised approaches and aggregation, GIB might facilitate greater volume of investment into the sector.

- **SS RES:** Many respondents did not feel there was a compelling requirement for continued GIB intervention in the sector. Of those that felt GIB could continue to play a role, they suggested that GIB needed to find a way to efficiently aggregate projects together to package them up to investors as a portfolio of projects. However, no interviewees proposed how this might be done and some noted that it was particularly challenging given that these small-scale projects are fairly diverse in their features.

Common amongst the responses we received regarding GIB's future product offering in other non-core sectors was the proposal that GIB take on a role in both encouraging demonstration projects and in developing tools that might help standardise the investment process and transaction structure. Several respondents also felt that GIB should dedicate resources to fully appraising the investment potential of projects in new sectors and, where necessary, should be prepared to take on a larger share of the project risks than commercial investors, at least in the early stage of a sector's development.

Many of the suggestions we received, however, would contradict GIB's current rule of investing alongside private capital at market terms. This begs the question as to whether such a rule can be or should be partly relaxed and, if so, what implications this may have on GIB's capital structure. As we noted in our framework for assessing future sectors (section 6.4 above), it is important that adequate policy incentives are provided in order to create the right conditions for private sector investors. We do not think that GIB can be effective as a substitute for more conventional policy measures. That is not to say that GIB should not consider the possibility of taking on greater risk than commercial investors in certain transactions – for which there was significant strong support amongst many of the investors, project developers and government officials that we talked to. The question is how to do so in a manner that develops the overall market and mobilises private sector capital.

We therefore think that there may be a role for GIB to further differentiate itself from commercial banks via a number of different product options. There would be value to GIB exploring the extent to which private capital providers may be willing to provide credit enhancement products alongside it (e.g. contingency equity from some insurance companies and/or hedge fund investors, partial risk guarantees, etc.). GIB could also consider options such as taking less attractive junior debt positions, investing in less mature technologies and committing resources, which commercial banks would not be able to prioritise, to the appraisal of new sectors and technologies. However, it should only do so where there is sufficient policy support to ensure that such intervention is not over-used; it should be reserved for certain strategic projects. This approach would be in line with that of the Australian CEFC, noted above, which has a capped pot each year of funding that it is able to deploy at below market rates. But it would require specific consent from Government (and possibly separate State Aid approval) as it is not within the current budgeting framework applied to GIB.

## 7. Conclusions

Our review of GIB has looked at its impact to date on the four core sectors of offshore wind, waste & bioenergy, non-domestic energy efficiency and small-scale renewables as well as examining the case for continued intervention by GIB in both these sectors and the wider green economy. We have relied upon a number of sources to inform our evaluation, including an online survey of market participants, discussions with GIB staff, a number of follow-up interviews with government officials and market participants (including both project partners of GIB's as well as investors and project developers that have not yet directly interacted with GIB) and both public and confidential literature that GIB has provided us with.

To date, GIB has deployed slightly less than half of the £3.8 billion of public money it has been allocated to projects across the core four sectors. Including commitments GIB has made to funds or partners takes it to just over half of the total (£2 billion committed out of the £3.8 billion made available). At this half way stage, GIB has deployed its capital at an average mobilisation rate of 3.4, meaning that if this rate is maintained over the second half of GIB's investments this would imply total private sector co-investment worth over £13 billion. This is a material, but small, fraction of the £330 billion of investment estimated as required across the green economy between 2011 and 2020.<sup>76</sup> It is also important to note that this excludes any wider impact that GIB has had in encouraging investors into its core sectors and facilitating the flow of capital into other projects, which we have not been able to measure as part of this study.

The sectors that GIB has focused on differ in terms of the scale of projects, the types of market participants, the degree of policy support they receive and the relative importance of the barriers to investment that prevent sufficient private sector capital from flowing into them. GIB has committed almost 70 per cent of its capital (£1.1 billion) on seven direct investments in the OSW sector, helping mobilise an additional £2.9 billion of private capital at a mobilisation rate of 2.6. The next largest capital outlay has been in the W&B sector where it has deployed almost £0.5 billion of capital, helping mobilise a further £2.7 billion from private investors, at a significantly higher mobilisation rate of 5.6. GIB has deployed significantly less capital so far in the NDEE and SS RES sectors (£50 million and £10 million, respectively), both of which also have mobilisation rates below 2.

At a sector level we found a complex and mixed assessment of GIB's impact across sectors, and also within sectors, which can be summarised as follows:

- **OSW** – Tackling insufficient liquidity emerges as one of GIB's principal achievements in OSW over its first two and a half years. Several market participants that we spoke to highlighted GIB's role in providing a degree of reassurance to co-investors, both due to its experience and understanding of the sector as well as the fact that it was committing its own capital (from government), offering "skin in the game". The majority of those we spoke to believed that GIB had been instrumental in either providing liquidity to the market when it was needed or in preventing delays to the transactions it participated in,

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<sup>76</sup> Note that GIB's mandate limits its investments to four sectors (and only three prior to May 2014), further restricting the total impact it can have in addressing the investment requirement across the whole of the green economy.

and that GIB's involvement helped to increase investor confidence in the sector and thereby reduce the returns that co-investors would otherwise have demanded had they invested in UK offshore wind projects *without* GIB. Our survey responses, and some follow-up interviews, suggested that a number of market participants believed that at least some of the transactions that GIB participated in could have gone ahead anyway without GIB, questioning its additionality in the sector. These responses mainly referred to GIB's refinancing of operational assets – and other respondents believed that these transactions did provide the market with needed liquidity at a time when it was in short supply. Over the past two and half years, in line with GIB's stated investment strategies, there has been a change in focus in OSW, from debt to equity and from operational refinancing to late-stage construction and most recently, construction.

- **W&B** – GIB appears to have also been successful in addressing liquidity issues in the W&B sector, where it stood in to help deliver a number of large scale municipal waste projects that were under threat due to the withdrawal of PFI support and mitigated shortfalls in capital supply in the wake of the financial crisis. Opinion has been mixed about whether GIB had invested sufficiently in projects using less mature technologies, with some suggesting that GIB has been too conservative in its project choices, whilst others recognised that some of GIB's fund investments have been in less proven technologies, particularly over the past 12 months. GIB has moved from investing in debt in large local authority supported transactions to smaller, merchant focused, equity investments using more innovative waste processing technologies. GIB has also had some success in using fund managers to deploy capital into the sector, but it is not yet clear whether these types of investment have the potential to be scaled up (and standardised) in a way that will attract the capital of large institutional investors to the sector.
- **NDEE** – Our survey responses corroborated our discussions with GIB staff, finding that the biggest obstacle to private capital in the NDEE sector is the diffuse and immature nature of markets, followed by inadequate transaction structures and products, which is a natural corollary of the fact that markets are not well developed. Although GIB has focused on these barriers, the Bank appears to have had less success in addressing them, relative to the OSW and W&B sectors. GIB has seeded a number of funds to invest in the sector in an effort to stimulate the aggregation of small transactions. Overall, it has deployed significantly less capital into the sector, suggesting that GIB has not identified enough “investment-ready” projects. Even though GIB's deployment of funds to NDEE has been limited, market participants believed that GIB was moving in the right direction and helping the sector mature by putting in place a set of helpful financing structures and products (notably for Local Authorities and the health sector). Respondents remarked on the large team that GIB had assembled, with good understanding of the market and issues that it faced.
- **SS RES** – GIB has only been active in this sector for a short amount of time, which limited the extent to which we were able to evaluate its impact. GIB has committed capital to two investment vehicles, which aggregate small-scale projects together, and this commitment forms one of the largest pools of capital available in the sector. However, it has not deployed a significant amount of capital into projects to date and a number of market participants have suggested that there is not a clear role for GIB to play in this sector. This may reflect the short period of time that GIB has committed capital to the sector, as GIB believes the tenor of financing that it is willing to provide differentiates it from others serving the market.

A repeated point that emerges from our analysis is that GIB has been able to provide information about the sectors it invests in to help co-investors better understand risks, and has helped to disseminate best practice. Although other organisations with a predominantly technical or advisory focus are also able to perform such functions, GIB's status as an investor seeking to earn a commercial return on its investments is likely to provide it with incentives that differ from those facing other types of organisation, and also may make it more effective in identifying solutions and in demonstrating them to the wider market.

The second part of our analysis considered GIB's potential future role in its current core sectors before looking at the case for GIB intervention in other sectors of the green economy and the types of product offering that would be most effective in terms of crowding in private capital.

Our findings regarding GIB's future role in the core four sectors can be summarised as follows:

- **OSW:** Survey respondents indicated that GIB could continue to play a role in addressing the barriers to investment that continue to be present in the OSW sector. Notably interviewees highlighted that liquidity is less of an issue now than it was in 2012, the major need now being the provision of equity to earlier-stage construction projects. Some respondents suggested that GIB's involvement in operational projects might need to be reduced if it is to avoid competing with private investors and noted that the market might benefit from GIB focusing on riskier projects, such as those in deeper waters, employing new technologies, or at an earlier stage of the project life-cycle. This is in line with the creation of the GIB managed Offshore Wind Fund, which allows GIB's role to evolve from project investor to manager of institutional investment and frees up capital for GIB to focus on early-stage or otherwise riskier investments in the future.
- **W&B:** Technology risk – the top ranked barrier to investment – was the barrier that most survey respondents thought could benefit greatly from GIB's involvement. This is in line with comments we have heard through our interviews suggesting that GIB participation in standard energy from waste projects is no longer needed and that it should focus its attention on more immature technologies and in developing a product to reduce the risks associated with security of feedstock supply.
- **NDEE:** Our results for the NDEE sector give a strong indication that there is a role for GIB to make a positive contribution to breaking down the barriers to investment in the market. Most of the industry participants that we talked to agreed that this was a particularly difficult area into which to encourage investment, potentially requiring a step change in approach. Whilst different people offered different views on what GIB might do in the future to stimulate investment in non-domestic energy efficiency, a common theme emerged that GIB should consider offering products to the market that either required lower returns or took on higher risk than other commercial banks are prepared to accept – essentially providing some form of concessionary finance, which is currently outside GIB's mandate.
- **SS RES:** Of the four core sectors, the market participants that we spoke to were least in favour of maintaining GIB intervention in the small-scale renewables sector. Both government staff and investors suggested that the existing policy support in place for solar, onshore wind and small-scale hydro projects was sufficient to encourage the

investment required to meet the UK government's 2020 renewable targets for the electricity sector. The survey results seem to suggest that if GIB could develop a product that was able to aggregate a large number of relatively standardised small-scale projects with similar characteristics, this could provide a boost to the sector. It is too early to tell whether GIB's seeding of two tailored investment vehicles can partially meet this need.

In our analysis of other sectors that GIB might turn its attentions to over the next five years, energy storage came out as the sector with the greatest need for GIB intervention in our survey, followed by CCS, wave and tidal, low carbon transport and domestic energy efficiency. Our follow-up interviews also reinforced the view of energy storage as a sector that GIB should consider in the near future, although new storage technologies are still at a relatively immature stage and are not yet "investment ready". Respondents thought GIB could certainly play a role in large scale CCS, nuclear and tidal projects, which require significant financing for individual projects, and may initially lack sufficient private sector interest.

A clear message emerging from our review is that GIB's role as a complement to other policy measures, is most effective in encouraging the development of relatively immature sectors. It is an important tool where private sector financiers lack the resources to fully engage with and understand the technology and regulatory risks – but where the commercial proposition is nevertheless viable – usually because of complementary support policies. As the technology and regulatory landscape is continually shifting and developing – along with the resulting flows of capital – we think that it is appropriate for GIB to regularly assess where its public capital and expertise can be deployed most effectively. At the same time we still see benefits from focusing on specific green sectors that GIB and/or the government has singled out as particular priorities. GIB involvement in a sector is likely to be most effective where there are clear, credible green targets (at the UK, and potentially EU level), where corresponding government policy is in place to create the right conditions for investors, and where there are clear barriers to investment present in the sector, which are due to market failures. We also suggest that GIB continues to prioritise its focus based on investment needs and, more precisely, based on the investment gap in sectors relative to historic financing trends.

In terms of product offerings, a role for GIB to act as a guarantor of private debt issuance came out as the option which respondents believed would attract the largest amount of capital to the green economy. GIB investing in demonstration projects was ranked second by respondents in terms of attracting private capital. Common amongst the responses we received regarding GIB's future product offering in other, non-core, sectors was the proposal that GIB take on a role in both encouraging the development of riskier projects than commercial banks might currently be prepared to invest in and in developing tools that might help standardise the investment process and transaction structure. As noted above, many of the responses we received would contradict GIB's current business model which is centred on investing alongside private capital at market terms - a role which is valued by project developers and co-investors – unless market participants were willing to co-invest alongside GIB through the proposed new instruments, where private investors offer terms that differ from GIB's concessionary terms.

We think that there may be a role for GIB to expand its product offering, including providing credit enhancement products and potentially taking on junior debt positions; both of which other green development banks that we compared in our study do offer to some extent.



Insurance companies and/or hedge funds may well be interested in co-investing alongside GIB in certain situations. Such action by GIB should, however, not be viewed as a *substitute* for a policy environment designed to provide the support that investors need.

## Appendix A. List of GIB Transactions as at the end of May 2015

Sector	Name	Date	Type of GIB Investment	GIB Investment £m	Private Co- Investment £m	Mobilisation Multiple
OSW	Walney	12-2012	Debt	45.6	178.7	3.9
OSW	Rhyl Flats	3-2013	Equity	57.5	57.5	1.0
OSW	London Array	10-2013	Debt	58.6	207.4	3.5
OSW	Gwynt y Mor	3-2014	Equity	220.0	220.0	1.0
OSW	Westermost Rough	3-2014	Equity	240.8	647.6	2.7
OSW	Sheringham Shoal	11-2014	Equity	240.0	240.0	1.0
OSW	Westermost Rough refinancing	12-2014	Equity	0.0	377.8	
OSW	Rampion	5-2015	Equity	232.9	951.8	4.1
W&B	Foresight UKWREI fund	6-2012	Capitalisation	50.0		
W&B	Greensphere fund	7-2012	Capitalisation	30.0		
W&B	Biogas plant Dagenham (UKWREI)	8-2012	Fund	2.0	18.9	9.6
W&B	Greenlight AD project (Greensphere)	11-2012	Fund	7.8	8.2	1.1
W&B	Drax biomass conversion	12-2012	Debt	50.0	940.0	18.8
W&B	Wakefield waste PFI	1-2013	Debt	30.4	91.3	3.0
W&B	Gloucester waste PPP	2-2013	Debt	46.8	138.6	3.0
W&B	Evermore waste to energy plant (UKWREI extension)	7-2013	Equity	20.2	61.1	3.0
W&B	Port Talbot biomass plant (Greensphere)	9-2013	Fund	11.3	13.6	1.2
W&B	West London waste PFI	11-2013	Debt	20.0	203.7	10.2
W&B	Birmingham BioPower gasification plant	12-2013	Debt	12.0	29.4	1.7
W&B	Birmingham BioPower gasification plant (UKWREI)	12-2013	Fund	5.6		
W&B	Merseyside Waste PFI	12-2013	Debt	20.0	315.5	15.8
W&B	Northern Ireland on-farm AD: Par Renewables (UKWREI)	4-2014	Fund	1.5	1.5	1.0
W&B	Willen anaerobic digestion project (UKWREI)	5-2014	Fund	7.4	7.5	1.0
W&B	Northern Ireland on-farm AD: Bridge Energy (UKWREI)	6-2014	Fund	1.7	1.8	1.0
W&B	Greenlight AD follow on investment (Greensphere)	6-2014	Fund	1.9	2.1	1.1
W&B	Speyside CHP project	8-2014	Equity	12.8	61.5	4.8
W&B	Derby energy from waste plant	8-2014	Debt	63.6	127.3	2.0
W&B	North Yorkshire waste treatment plant	10-2014	Debt	33.4	286.0	8.6
W&B	Widnes CHP plant	11-2014	Debt	16.9	80.1	2.7
W&B	Widnes CHP plant (UKWREI)	11-2014	Fund	13.2		
W&B	Foresight Recycling and Waste Fund	1-2015	Capitalisation	50.0		
W&B	Hoddesdon (UKWREI Extension)	2-2015	Equity	29.9	30.5	1.0
W&B	Lenvenseat recycling and waste plant (UKWREI)	3-2015	Fund	28.3	82.7	2.9
W&B	UKWREI extension (Levensseat)	3-2015	Capitalisation	10.3		
W&B	Old Quarrington anaerobic digestion plant (RAW)	3-2015	Fund	2.0	2.0	1.0
W&B	Tilbury renewable power facility	3-2015	Equity	35.0	155.1	4.4
NDEE	SDCL fund	9-2012	Capitalisation	50.0		
NDEE	Equitix fund	10-2012	Capitalisation	50.0		
NDEE	Aviva Investors fund	3-2013	Capitalisation	50.0		
NDEE	Roundwood biomass boiler platform (Equitix)	4-2013	Fund	4.9	5.1	1.1
NDEE	Kingspan building retrofit (SDCL)	7-2013	Fund	0.4	0.4	1.0
NDEE	Distillery biomass platform 1 (Equitix)	7-2013	Fund	0.6	0.6	1.1
NDEE	Schools biomass platform (Equitix)	7-2013	Fund	0.4	0.5	1.1
NDEE	NCP low energy lighting project (SDCL)	12-2013	Fund	2.1	6.7	3.2
NDEE	St Bartholomew's Hospital energy efficiency retrofit (SDCL)	1-2014	Fund	1.3	1.4	1.1
NDEE	Societe Generale Equipment Finance funding alliance	2-2014	Capitalisation	25.0		
NDEE	SGEF Rampton	2-2014	Fund	2.5	2.5	1.0
NDEE	Bernard Matthews boiler replacement programme (Equitix)	2-2014	Fund	12.0	12.7	1.1
NDEE	Cheltenham General Hospital CHP (Aviva)	2-2014	Fund	1.2	2.1	1.8
NDEE	Distillery biomass platform 2 (Equitix)	3-2014	Fund	1.9	2.0	1.1
NDEE	SME energy efficiency platform (SDCL)	6-2014	Fund	0.9	1.0	1.1
NDEE	Citi data centre retrofit (SDCL)	9-2014	Fund	2.5	2.8	1.1
NDEE	De Lage Landen funding alliance	9-2014	Capitalisation	25.0		
NDEE	DLL Queen Medical Centre	9-2014	Fund	3.7	3.7	1.0
NDEE	EECo Biomass Moy Park (SDCL)	9-2014	Fund	3.9	4.2	1.1
NDEE	Equitix fund extension	10-2014	Capitalisation	50.0		
NDEE	Glasgow City Council streetlighting project	12-2014	Debt	6.3	0.0	0.0
NDEE	Sheltered housing boiler replacement project (Equitix)	12-2014	Fund	2.4	2.6	1.1
NDEE	Climate Energy (Equitix)	5-2015	Fund	2.4	2.6	1.1
SS RES	Temporis lending programme	10-2014	Capitalisation	100.0		
SS RES	Srondoire (Temporis)	12-2014	Fund	4.2	6.5	1.5
SS RES	Albion Community Power	2-2015	Capitalisation	50.0		
SS RES	Goathill Quarry (Albion)	2-2015	Fund	0.9	2.8	3.1
SS RES	Tafarnaubach (Albion)	2-2015	Fund	0.7	1.1	1.7
SS RES	Chaorach (Albion)	5-2015	Fund	4.4	4.4	1.0

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