Global Green Investments

Report for Green Purposes Company

Duncan Oswald
Tanguy Tomes
Amy Nicholass

26th April 2019

Report for Green Purposes Company Limited

Prepared by Duncan Oswald, Tanguy Tomes and Amy Nicholass

Approved by

Mike Brown

(Project Director)

Eunomia Research & Consulting Ltd
37 Queen Square
Bristol
BS1 4QS

United Kingdom

Tel: +44 (0)117 9172250
Fax: +44 (0)8717 142942

Web: www.eunomia.co.uk

Acknowledgements

Our thanks to Climate Bonds Initiative, Soil Capital, Moody's, Natixis, Triodos, Green Bank Network and the United Nations.

Disclaimer

Eunomia Research & Consulting has taken due care in the preparation of this report to ensure that all facts and analysis presented are as accurate as possible within the scope of the project. However no guarantee is provided in respect of the information presented, and Eunomia Research & Consulting is not responsible for decisions or actions taken on the basis of the content of this report.

Version Control Table

Version	Date	Author	Description
V0.1	12/03/19	Duncan Oswald	First draft (internal)
V0.2	27/03/2019	Duncan Oswald	Completed first draft for internal review
V0.3	28/03/2019	Duncan Oswald	Draft for issue to client
V0.4	11/04/2019	Tanguy Tomes	Revisions following client feedback
V0.5	12/04/2019	Amy Nicholass	Continued with edits following client feedback and prepared for public version
V0.6	17/04/2019	Duncan Oswald	Review for issue
V0.6b	26/04/2019	Duncan Oswald	Final draft

Contents

1.0 Introduction

The Green Purposes Company (GPC) holds a special share to safeguard the green mission of the Green Investment Bank (GIB). This safeguard was created by Parliament to come into effect when the GIB was transferred to private ownership, since when the GIB remains the holding company but all transactions are now conducted by the wholly-owned subsidiary known as the Green Investment Group (GIG).

The Green Purposes Company (GPC) exists to protect the Green Purposes (GPs) of the Green Investment Bank (GIB), now more commonly referred to as the Green Investment Group (GIG). The Green Purposes are:

1) The reduction of greenhouse gas emissions;
2) The advancement of efficiency in the use of natural resources;
3) The protection or enhancement of the natural environment;
4) The protection or enhancement of biodiversity;
5) The promotion of environmental sustainability.

We understand that GPC wishes to inform itself of the breadth of green investments being made globally today. There is particular interest in investments extending beyond the first two Green Purposes and in investments which embrace projects outwith existing, relatively mature technologies.

The requirement of the Green Purposes is such that [1] an investment must deliver a net gain in at least one Green Purpose, and GIG has demonstrated this on each occasion. Notably, Green Purposes 3, 4, and 5 require only protection and promotion, so could be interpreted as safeguarding principles rather than requiring action. However, a broader interpretation of the spirit of the Green Purposes would be an intention, whenever possible, to enhance biodiversity and the natural environment, and to actively promote environmental sustainability.

To better reflect the spirit of all five purposes, GPC would ideally like to see GIG further diversify its portfolio. To provide a better foundation for the validity, or otherwise, of this aspiration, GPC has asked Eunomia to undertake a review of green investments worldwide, inclusive of all five purposes; in particular to address the question: are there any commercially successful investments which address the spirit of Green Purposes 3, 4, and 5?

There is particular interest in investments made by institutions with similar commercial requirements, as these would be especially powerful exemplars.

[1] It is noted that GIG does not necessarily hold on to its investments in the long-term. In this report, the term 'portfolio' is used interchangeably with 'investment history'.

From the results of this review, GPC hopes to have a better view of relevant investments worldwide, from which to select examples to discuss with GIG, based on factors such as investment size, type, risk form, technology, and geography.

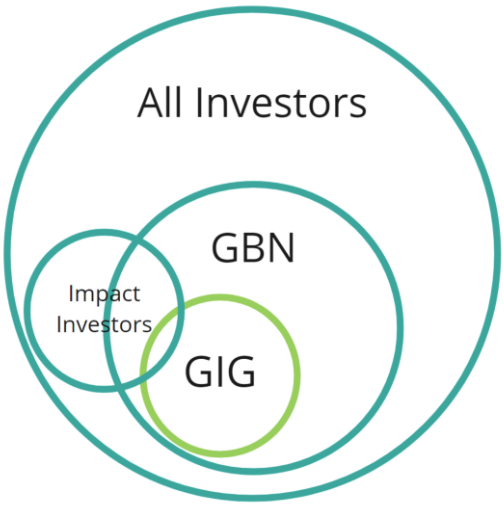
As a result of this work, GPC may also be able to reconsider strategic priorities with regards to how it is best able to scrutinise GIG's investment decisions.

2.0 Methodology

Green investments are made by a diverse palette of investors from around the world. Some are philanthropic, some are personal, some are commercial. GIG is a privately-owned bank with explicit Green Purposes and a need for competitive rates of return. Other investors can therefore be categorised in terms of similarity to GIG as shown in

Figure 1.

Figure 1: Levels of Institutional Similarity



The methodology in this research broadly reflects this categorisation. The most detailed research is afforded to those institutions most similar to GIG (Section 2.1), and selected case studies are used to represent relevant investment activity by less similar institutions (Sections 2.2 and 2.3) and for Green Bonds (section 2.4).

2.1 Green Investment Banks

GIG is a member of the Green Bank Network (GBN).[2] The GBN is a group of institutions similar to GIG, from around the world, which connect in order to share expertise and

[2] https://greenbanknetwork.org/

best practice. As of March 2019, there are 7 members from Europe, North America, Asia, and Oceania. Detailed and consistent data on investments made by these institutions is publicly available.

All of the investments made since the beginning of 2016 were extracted from the GBN's publications. This timeframe is 3 years long, with around half of that preceding GIG's transfer to private ownership.[3] The sample represents a total of 137 investments, each of which was analysed for:

- Scale (in £M),
- Sector (e.g. residential, utility),
- Technology area (e.g. onshore wind, solar),
- Type (e.g. debt, equity), and
- Other details (e.g. demonstration of technology, co-investment)

This database aims to provide a summary of prevailing investment areas targeted by the 7 institutions most similar to GIG from around the world. In Section 3.1, it is used to compare and contrast investment activity between GIG and the rest of the GBN, highlighting differences and opportunities.

2.2 Other Similar Investment Institutions

Many other institutions invest in green projects with requirements for commercial returns. These include ethical commercial banks, national development banks, private institutional investors, and large multi-national corporations which may have specific Environmental, Social and Governance (ESG) requirements or be seeking carbon offsets. These institutions' degree of similarity to GIG is highly variable, as is the availability of investment data.

Through a combination of grey literature, prior knowledge, and online searches, over 40 further institutions were identified. These included examples from around the world. They are listed in the spreadsheet which accompanies the electronic version of this report. From this list, selected case study investments were extracted and are reported in Sections 3.1.5 to 3.1.8. This selection was based on a combined judgement relating to similarity to GIG and data availability.

This work aims to further inform GPC's understanding of prevailing investment areas targeted by green institutions around the world.

2.3 Other Green Investments

During the course of the research, it became apparent that there was relatively little precedent for investment in Green Purposes 3, 4 and 5 by similar institutions. A brief exercise was therefore undertaken to see if these investments were occurring anywhere

[3] https://www.gov.uk/government/news/uk-governments-sale-of-green-investment-bank-completed

(by any type of investor) and to investigate details if they were found. Findings of this exercise are detailed in Section 3.2.

2.4 Green Bonds

Although GIG has not issued any bonds (they have provided consultancy advice), the risk/return profile, investment priorities and scale of green bonds is similar to the types of investment that they do make. There have been significant developments in the green bond market in recent years and good market information is available, so an assessment of green bonds has been undertaken to further inform the range of existing green investments. This is reported in Section 3.3.

3.0 Results

3.1 Green Investment Banks

The 7 GBN members are:

- the Australia Clean Energy Finance Corporation (CEFC),
- the Malaysia Green Technology Corporation (GTC),
- the Connecticut Green Bank (CGB),
- the New York Green Bank (NYGB),
- the Japanese Green Finance Organisation (GFO),
- the Green Investment Group (GIG), and
- the Rhode Island Infrastructure Bank (RIIB).[4]

The collective coverage of these institutions is far-reaching, although it is worth noting that GIG is the only institution in this network which invests outside of its home country. As a result of this, geographical analysis of investments by these institutions has not been carried out, as it reveals only that their investment are restricted to their own locations.

Since 2016, these institutions have together made 137 investments worth a total of over £4.5bn. These investments are unevenly distributed between members, with GIG being one of the more active members in this timeframe (Table 1). Full details of all investments can be found in the accompanying spreadsheet.

[4] https://greenbanknetwork.org/members/

Table 1: GBN Investments 2016-2018

Bank	CEFC	GTC	CGB	NYGB	GFO	GIG	RIIB
Region	Australia	Malaysia	Connecticut	New York	Japan	UK, EU	Rhode Island
Investments	74	1	9	23	11	18	1

This data set is not categorised according to GIG's Green Purposes but the following sections approach such an analysis by exploring it in terms of technology (Section 3.1.1) and sector (Section 3.1.2), picking out interesting case studies where relevant. CEFC was identified as a particularly interesting comparator institution and is explored in Section 3.1.3. A selection of interesting investments made by other GBN members is also explored in Section 3.1.4.

3.1.1 GBN Technology Areas

GBN investments since 2016 have spanned a variety of technology areas including renewable energy generation, waste management and sustainable transport. Across the GBN, there is a clear tendency towards investing in renewable energy sources (RES). For example, 49% of all investments included solar photovoltaic (PV) projects.

Figure 2: GIG and GBN Investments by Technology Area[5]

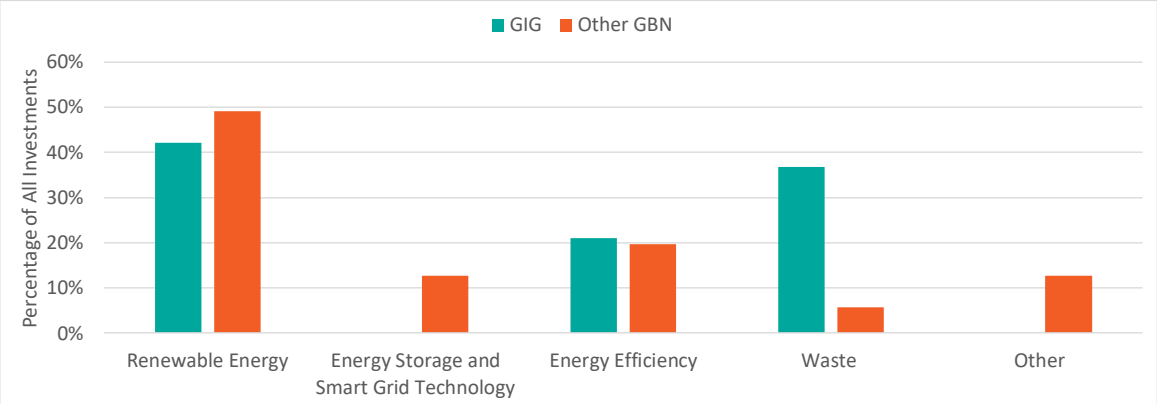


Figure 2 shows that the favouring of RES is consistent across GIG and the rest of the GBN. However, it also highlights two interesting differences:

1) GIG has put much more effort into investing in waste infrastructure than other GBN members.

[5] Note that these percentages do not add up to 100%. Some investments span multiple technologies and so are double-counted in this analysis. Nevertheless, the numbers are informative.

- 37% of GIG investments since 2016 have been in the waste sector compared to 6% for other GBN members.

2) Other GBN members have branched out into sectors that GIG is yet to invest in.
    - 26% of investments made by other GBN members were in sectors which GIG did not invest in. This suggests that peer institutions are currently casting their net wider than GIG, reflecting in part different policy landscapes in different countries. Additional technology areas addressed by other members include energy storage and sustainable transport, technologies which are discussed in more detail below. It is noted that GIG have already shown interest in some of these sectors.

Figure 3: GIG and GBN Investments by Technology

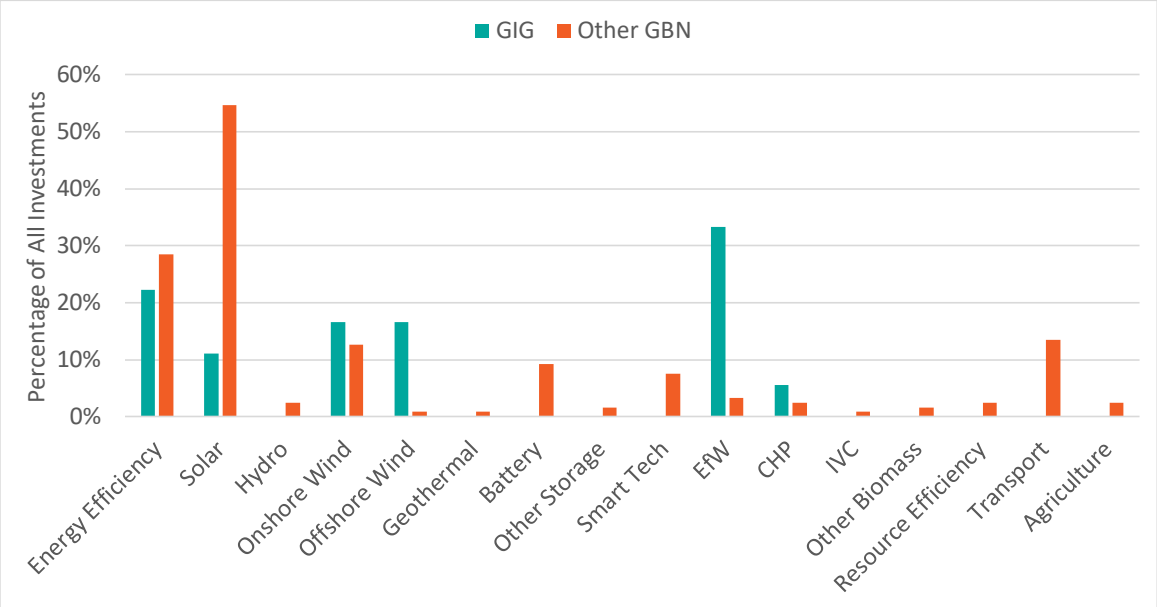


Figure 3 shows the same investment data at a higher resolution. It reveals further differences between the investments of GIG and those of other GBN members. For example, GIG has:

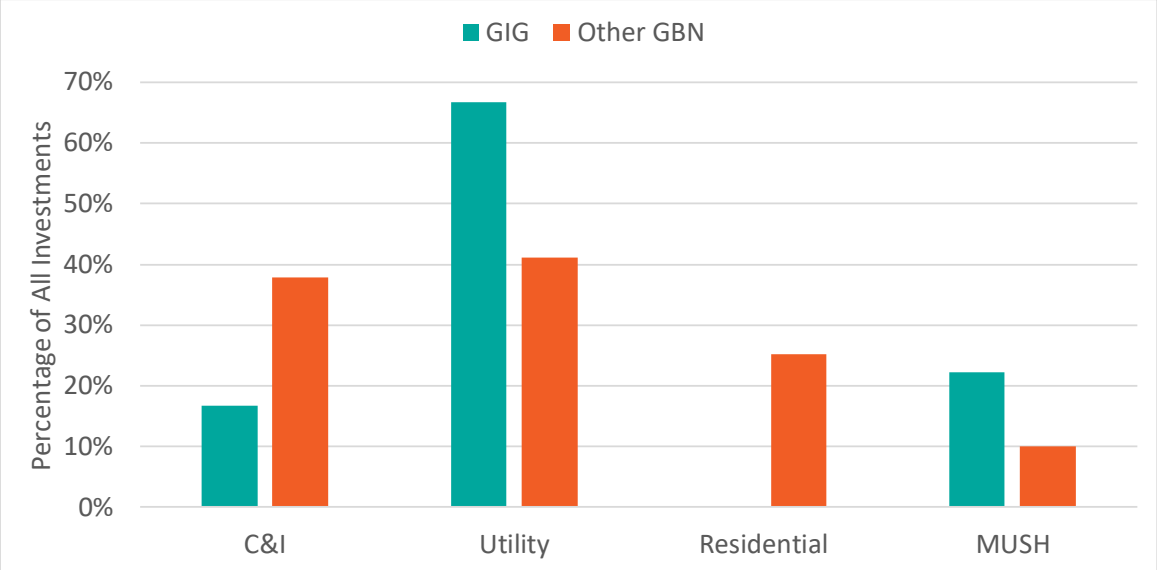
- Invested less in solar than other GBN members. (This aligns with GPC's aspirations for GIG to tend towards less well-established technologies and may also reflect the relatively low effectiveness of solar and relatively low grid carbon intensity in GIG's local area.)
- Invested more in offshore wind than other GBN members. (Offshore wind in the UK is now relatively well-established and mainstream investors are able to compete for projects. There is now the opportunity for GIG's expertise in offshore wind to be used to accelerate deployment of offshore wind capacity elsewhere in the world.)
- Focused almost all investment activity in the waste sector into a single technology. (33% of all GIG investments in this timeframe were in energy-from-waste (EfW) facilities. The equivalent number for other GBN members is 2%.

3.1.2 GBN Sectors

In the timeframe considered,[6] two-thirds of GIG investments were in the utility sector. The other third was made up of public sector investments (in Municipalities, Universities, Schools and Hospitals; MUSH) and, to a lesser extent, investments in commerce and industry (C&I). No investments were made in the residential sector.

This emphasis on utility sector investments was not reflected in the investments of other GBN members. Although utility was the single most popular sector amongst these institutions, the overall distribution was much more balanced. Notably, well over 20% of other GBN investments were in the residential sector. Investments included a revolving credit facility provided by NYGB which enabled expansion of household energy efficiency upgrades.[7]

Figure 4: GIG and GBN Investments by Sector



3.1.3 Australia CEFC

In the context of institutions similar to GIG, Australia's CEFC is a particularly interesting case study. The two institutions' investment criteria appear to be comparable (Table 2) and yet their investment portfolios, at least within this timeframe, tell quite different stories. In the timeframe studied, CEFC made almost 4 times as many investments as GIG, including 35 investments into 7 technology areas in which GIG invested nothing. CEFC also showed greater diversity in terms of sectors receiving investment and financial mechanisms used to invest.

[6] GIG was a government-owned entity at the beginning of 2016 and was transferred into private ownership approximately halfway through the sample period.

[7] https://greenbank.ny.gov/-/media/greenbanknew/files/Transaction-Profile-Sealed.pdf

Table 2: GIG and CEFC Investment Criteria

Institution	CEFC	GIG
Investments	74	18
Average Investment (£M)	44	85
Investments above £50M	31	4
Returns Required[8]	Commercial	Commercial
Founding Year	2012	2012

The seven technology areas in which only CEFC invested are detailed in Table 3 alongside selected project details. Most investment areas relate to Green Purpose 1, although none of these investment areas are RES. Several investments relate to Green Purpose 2 and Green Purpose 5, but equally apparent is the lack of investments relating to Green Purposes 3 and 4.

Table 3: CEFC Investments in Innovative Technologies

Technology	#	Green Purpose	Project Details
Battery Storage	7	1, 5	Residential battery loans; First non-subsidised utility-scale battery project; First integrated wind-solar-battery project in Australia; Maximising second life of Electric Vehicle (EV) batteries in utility applications
Other Storage	3	1	Solar with pumped hydro in an abandoned mine; Investing in financial products (bonds, funds) targeting energy storage
Smart Grid Technology	9	1, 5	Scaling up and commercialising operations of companies making smart grid technologies; Investing in peer-to-peer lending platform for green projects
In-Vessel Composting	1	1, 2	Early example of IVC in Australia

[8] CEFC aims for returns of around 6% across its portfolio. Since inception, its core portfolio has achieved a return of 4.44% (https://annualreport2018.cefc.com.au/performance/analysis-of-performance-criteria/).

Technology	#	Green Purpose	Project Details
Resource Efficiency	1	2	Financing to support improvements in manufacturing processes and increase resource recovery
Transport	11	1, 2, 5	Interest rate buy-down for low-emission vehicle loans; EV infrastructure across a building portfolio; Investing in a terminal to facilitate shift of freight transport mode from trucks to trains; Energy efficiency at ports and airports; Investing in company making lightweight wheels (6% fuel efficiency); Investing in climate bond targeting sustainable transport
Agriculture	3	1, 2, 5	Investing in precision agriculture; Interest rate buy-down for businesses buying more efficient farm machinery e.g. efficient irrigation systems

CEFC investment activity was distributed across the different sectors, including 13 investments in the residential sector. Proportionally, CEFC's investment activity in the Commercial & Industrial (C&I) sector is larger than that of GIG. This breadth appears to be a product of CEFC's wider range of financial mechanisms. These also allow CEFC to invest in earlier-stage technologies and bring them to scale and to invest in more decentralised technologies. Mechanisms include:

- Buying down interest rates to make existing green financial products more attractive,
- Investing in companies making innovative green products,
- Investing in building portfolios to drive change,
- Investing (at scale) in a fund which can target smaller projects, and
- Helping partners bring green financial products to market.

GIG's existing processes seek to quantify precisely impacts such as emissions savings and this approach may be challenging with respect to some of the above investments. The green credentials of these investments are demonstrable, if not so easily quantifiable, and CEFC have also demonstrated their commercial viability.

3.1.4 Other Selected GBN Investments

Beyond Australia's CEFC, other GBN members have also made several interesting investments in areas not targeted by GIG. These include:

- CGB investing around £1.8m in an Archimedes screw hydropower generator,
- NYGB investing over £20m to enable the growth of fuel cell markets for forklifts,
- NYGB investing around £50m in a bike share system for New York, and

- Several GBN members making investments in EV infrastructure and making EV purchases more attractive for individuals and businesses e.g. by interest rate buy-downs. Although green, such investments represent a very different business model to those of GIG's past.

NYGB aims for portfolio-level profitability[9] and is achieving that as of 2017.[10] CGB is slightly less commercial, aiming only for preservation of public capital.[11]

Energy efficiency is also an interesting area. Figure 2 and Figure 3 give the impression of comparable activity between GIG and other GBN members. However, GIG's investments in this area are limited to LED streetlighting and all precede GIG's transfer to private ownership. Across the rest of the GBN, energy efficiency investments include this technology amongst many others. In Australia, CEFC has invested in low-carbon building demonstration projects and has partnered with large property portfolio holders to implement far-reaching efficiency upgrades. In the USA, NYGB developed a revolving credit facility to expand energy efficiency upgrade solutions across existing housing stock. This transaction type is innovative, potentially replicable and indeed, urgently needed to help reduce carbon emissions from UK domestic properties in order to achieve the goals of the 2008 Climate Change Act[12].

3.1.5 Other Similar Investment Institutions

Around 40 further similar institutions were identified in the course of this research. They are listed in full in the accompanying spreadsheet. They include national and international development banks, ethical commercial banks, and impact investment institutions. These were similar to GIG in regard to their values and purpose but varied in terms of similarity in locations invested in, size of investments and approach to profit.

Some particularly interesting case studies are detailed below.

3.1.6 Technology Fund

This Swiss Government-owned fund, with outsourced operations, was founded in 2014 and is available only to Swiss companies with innovative green technologies which need scaling up, providing loan guarantees to enable other banks to do the lending. The fund specialises in GHG reduction, energy efficiency, renewables and natural resource conservation. The fund's maximum guarantee value is CHF 3m, with the guarantees designed to underwrite larger loans or as joint guarantees, so the total investment in supported projects/companies is greater. The fund's focus is on scaling up innovative environmental and low-carbon technologies that face a deployment gap which is

[9] https://greenbank.ny.gov/Investments/Investment-Strategy
[10] http://coalitionforgreencapital.com/2017/08/28/ny-green-banks-path-profitability/
[11] http://coalitionforgreencapital.com/2017/04/05/connecticut-green-bank-fact-sheet/
[12] https://www.theiet.org/media/1675/retrofit.pdf

relevant to Green Purposes 2, 3, 4 and possibly 5. The companies that the fund support have a wide variety of interesting and novel ideas.

3.1.7 Mirova

This private institutional investor based in France (but with global investments) focuses on natural capital and renewable energy projects (170 wind, solar, biomass renewables projects in the past 15 years) in Europe and financing of a wide variety of responsible infrastructure projects in France and Europe (universities, stadiums, hospitals, urban and rail transport, road infrastructure, etc.) with total commitment of €2.8bn and significant participation in public-private partnership projects representing an aggregate amount of more than €6bn.

Mirova has expanded beyond renewables investments into natural capital. They acquired 51% of equity ownership of Althelia Ecosphere (asset management company), (see Section 3.3.3 below). The Althelia Funds of Mirova include:

- The Althelia Climate Fund (ACF), a € 101m initiative launched in 2014 in partnership with Conservation International;
- Land Degradation Neutrality, launched in 2017 in partnership with the United Nations Convention to Combat Desertification for restoration of degraded lands and the sustainable management of soils; and
- Sustainable Ocean Fund for sustainable fisheries and aquaculture in partnership with Conservation International and the Environmental Defense Fund (this includes sovereign downside guarantee and significant institutional co-investment).

3.1.8 Triodos Bank

Triodos has over €15bn in assets, creating impact in 65 countries to create social, environmental and cultural value in a transparent and sustainable way. The bank was founded on the conviction that banking can be a powerful force for good. With UK operations based in Bristol, Triodos Bank has country branches in the Netherlands, Belgium, Spain, Germany and an agency in France. Triodos invests in:

- organic farming (approx. 100 farms and organisations invested in);
- renewable energy (wind farms, active leader in high head and low head hydro-electric schemes);
- ecological development; environmental technology (pond and wetland systems for treating sewage, in-vessel composting);
- organic food and sustainable production (Fairtrade producers like Cafe Direct and Ganesha).

Whilst being a commercial bank, Triodos demonstrably supports innovation. Its latest windfarm investment is a blue-print for future renewable energy/housing association partnerships and its innovative low head hydro-electric scheme, completed in late 2017, and at 500kW, is the largest low head scheme built in England this century; it also has

one of the largest community solar companies in the South West of UK, Mendip Renewables.

3.2 Other Green Investments

A broader scan of global green investment activity (by any institution) was also undertaken to identify other innovative investment areas, with particular interest in those targeting Green Purposes 3, 4 and 5. The findings are not exhaustive, but include developments in natural capital investments as well as other established international financial products such as certified bonds.

Some are readily investible and some require further development work but all have potential. Potential relevance to GIG could be either in terms of near-immediate investment or in terms of bringing more innovative products to market.

Many of these investments are made feasible by co-opting mechanisms intended for different purposes, such as carbon off-setting. Although involvement with offset markets would require very careful consideration, these areas should not necessarily be excluded on this basis. However, this finding does indicate that the economic system today is not set up to encourage investment in areas such as biodiversity.

The following headings set out the main areas of opportunity for investment:

3.2.1 Woodland

Investments in woodland are well-established. They are typically commercialised on the basis of timber extraction and/or carbon offset markets such as those driven by the United Nations Collaborative Programme on Reducing Emissions from Deforestation, Forest Degradation, sustainable forest management and afforestation/reforestation in developing countries (REDD+).[13] REDD+ only applies in developing countries so, while the mechanism has been used to generate revenue for sequestration projects (and for biodiversity projects, see Section 3.2.3), it does not apply in the geographical area within which GIB operates. However, there is potential for similar mechanisms to increase carbon sequestration and climate resilience in the developed world.

The scale of investment is appropriate for GIG and carbon benefits (Green Purpose 1) can be calculated. However, at this scale and with a focus on returns, care would need to be taken to justify any claim made on the basis of benefits regarding Green Purpose 3 and 4. Investments in this sector are sometimes interpreted as perpetuating the concept of an economy based on exploitation of the natural world and therefore counter to the promotion of environmental sustainability (Green Purpose 5).

As described in more detail in Section 3.3.3 below, the Committee on Climate Change has recently set out a plan for shifting land use in the UK to a more sustainable footing.

[13] https://www.un-redd.org/

This includes reforestation on the basis of carbon and biodiversity benefits but will require changes to the system of agricultural subsidies.

3.2.2 Water Catchments

Demand for investment in water catchments is an interesting vehicle by which to consider investing in projects addressing Green Purpose 3 and Green Purpose 4.

A compelling example is Washington DC's Environmental Impact Bond (EIB), launched in 2017.[14] If a project is able to demonstrate a reduction in peak surface water flow, it is paid for by flood authorities. The market here links primarily to climate adaptation and flood adaptation, with no clear direct link to the Green Purposes. However, the projects themselves often relate to forest conservation, sustainable agriculture or wetland restoration. They may improve biodiversity and protect or expand wild areas. As such, the potential for links to Green Purposes is actually very strong.

3.2.3 Sustainable Agriculture

GBN members have provided some evidence of investments in sustainable agriculture (Section 3.1.1). There is a growing agenda in the sector for sustainable intensification, including precision farming technologies and low-footprint systems such as hydroponics[15].

Regenerative agriculture is also regaining prominence across the world. The premise is that soil restoration and sustainable land management practices can:

- improve productivity,
- contribute to climate mitigation efforts, and
- ensure the long-term viability of agricultural soils.

These factors, alongside well-established markets for crops, make these investments particularly attractive. In the US, this sector has been valued at US$2.3 trillion[16] and a network of investors[17] is growing around it.

Investors are already demonstrating impatience with the agricultural sector, particularly meat producers, the majority of which are ignoring or actively refuting the recommendations of institutions such as EAT-Lancet[18], FCRN[19] and others. This is demonstrated through the work of organisations such as FAIRR[20], which models the risk to investors in meat production companies presented by their failure to address

[14] https://www.epa.gov/sites/production/files/2017-04/documents/dc_waters_environmental_impact_bond_a_first_of_its_kind_final2.pdf
[15] https://www.hutton.ac.uk/news/scotlands-first-vertical-indoor-farm-unveiled-hutton-dundee-site
[16] https://www.greenbiz.com/article/soil-becomes-fertile-ground-climate-action
[17] https://www.lifteconomy.com/rain
[18] https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/
[19] https://www.fcrn.org.uk/sites/default/files/project-files/fcrn_gnc_report.pdf
[20] http://www.fairr.org/about-fairr/

greenhouse gas emissions, biodiversity loss, water, waste impacts etc. FAIRR members are using their significant influence to compel companies to address these risks, as they represent a real and immediate threat to investors.

An example of an investment institution operating in this area is Althelia Funds, which is part-owned by Mirova, as discussed above. Althelia manages a range of funds which support sustainable agriculture, reforestation, regeneration and protection of sensitive habitats around the world. These are often (but not always) supported by partnership with aid bodies and infrastructure banks, as well as revenues from international climate schemes such as REDD+.

Althelia is notable not only because of the type of project that it invests in but also because of the unusual geographical regions in which it operates. In their case this is often facilitated by reducing risk through association with national governments and international agencies but it is a significant issue: commercial-grade risk/return ratios are hard to find in the countries which need this investment the most but the climate and biodiversity crises will not be solved by investment in the developed world alone.

However, this report is concerned with potential investments in the geographical range of the former Green Investment Bank. Having suffered under industrialised extractive capitalism for centuries, ecosystems in the developed world are typically even more compromised and at risk than those in the developing world but mechanisms such as the Clean Development Mechanism (CDM) and REDD+ do not apply, so there is not even opportunity to resort to methods used by Althelia to generate revenue and returns for investors.

The recent *"Sixth National Report to the United Nations Convention on Biological Diversity: United Kingdom of Great Britain and Northern Ireland*[21]*"* shows that the UK has failed on almost all its biodiversity targets (and the assessment of those it has passed is generous), while, for example last year's report from the Committee on Climate Change on "*Land use: Reducing emissions and preparing for climate change*[22]" sets out a vision for changing land use to promote climate resilience, mitigation, biodiversity and the rural economy. Change is required to bridge the gap from crisis to solution; once this change is made, there will be significant opportunity for investment.

3.2.4 Peatland Restoration

Investments in peatland restoration may address all Green Purposes apart from Green Purpose 2. However, they are commercialised on the basis of carbon offset markets and so come with all the associated reservations outlined above. In the UK, restorations must

[21] http://jncc.defra.gov.uk/pdf/UK_CBD_6NR.PDF

[22] https://www.theccc.org.uk/wp-content/uploads/2018/11/Land-use-Reducing-emissions-and-preparing-for-climate-change-CCC-2018.pdf

attain a standard called The Peatland Code[23] but the available scale of such investments in the UK may be limiting to GIG. It is possible that scale is less limiting further afield.[24]

3.2.5 Buildings

Resource efficiency in buildings, both new and existing, is an important area for Green Purpose 1, Green Purpose 2, and Green Purpose 5. It is one that GIG has invested less in relative to other green banks (Section 3.1). However, even the other green banks have focussed mainly on energy efficiency. Broader resource efficiency in buildings has significant environmental benefits too.[25] Exemptions from local taxes alongside energy savings and resilience to spikes in energy prices may form the basis of a possible financing model in this area.

Another emerging area for green buildings could provide scope for improving biodiversity. DEFRA's proposals for biodiversity net gains could create an offset market driving a wide variety of biodiversity projects across the UK. Similarly, London is bringing in an Urban Greening Factor,[26] mirroring the activities of many other cities such as Berlin and Helsinki. This means that a wide range of commercial buildings would have the opportunity for bringing about improvements in biodiversity, depending on how the counterfactual is formulated.

These schemes are still in development, and care would be required to ensure additionality (e.g. where compliance is a Planning requirement) but there may be potential for GIG to deliver on all Green Purposes with investment in resource and energy efficient buildings, together with associated biodiversity projects.

3.2.6 Fisheries

Around a third of world fisheries are exploited at levels that are biologically unsustainable[27] but even this figure masks an enormous loss of productivity resulting from generations of degrading baselines, accelerating exponentially with increases in human population, prosperity and the development of industrial fishing methods.

Even in this degraded condition, the World Bank estimates annual lost revenues from poor fisheries management at $83bn[28]. Proposals for reform of international fisheries management[29] have been extensively modelled and include a place for private investment. The UK Government's Marine Pioneer programme[30] is working through the implications of implementing some of these concepts at a local level.

---

[23] http://www.iucn-uk-peatlandprogramme.org/peatland-code
[24] http://cse.ucpress.edu/content/early/2017/12/17/cse.2017.000695
[25] https://www.green-alliance.org.uk/resources/Less_in_more_out.pdf
[26] https://www.london.gov.uk/sites/default/files/urban_greening_factor_for_london_final_report.pdf
[27] http://www.fao.org/3/i9540en/I9540EN.pdf
[28] https://openknowledge.worldbank.org/bitstream/handle/10986/24056/9781464809194.pdf
[29] https://www.edf.org/sites/default/files/documents/financing-fisheries-reform.pdf
[30] https://www.gov.uk/government/publications/marine-pioneer/marine-pioneer-achievements

While it is fair to say that all the practical details have not been worked out yet, there are clearly significant returns to be made if the combination of public and private governance and finance can be established. Such an approach would not only provide a financial return for investors but also improvements in natural capital, biodiversity, environmental sustainability and a wide range of ancillary benefits[31].

Investing in Marine Protected Areas is the subject of much industry discussion.[32,33] While current governance of UK waters makes development of novel mechanisms difficult, it is possible that this situation might change, should Brexit happen.

3.2.7 Advanced Wastewater Systems

Advanced wastewater systems will become increasingly important as society shifts towards a circular economy. They can be used to recover energy or other materials such as cellulose and precious metals. Supply of many resources is becoming increasingly threatened, as they come from problematic areas. These resources are summarised in the European Commission's list of Critical Raw Materials.[34]

Advanced recovery systems could therefore become an important area, aligning with GIG purposes of resource efficiency (Green Purpose 2) and environmental sustainability (Green Purpose 5). Overall, these remain at the research and development stage but could quickly become a large and important market. This thinking is more advanced in Europe than the UK, as demonstrated by recent Dutch and Danish wastewater strategies.

3.3 Certified Bonds

Over the past few years, there have been significant developments in the area of certified green bonds. Although GIG has not issued any bonds, bond investments are a good proxy for their investment profile in terms of risk profile and scale.

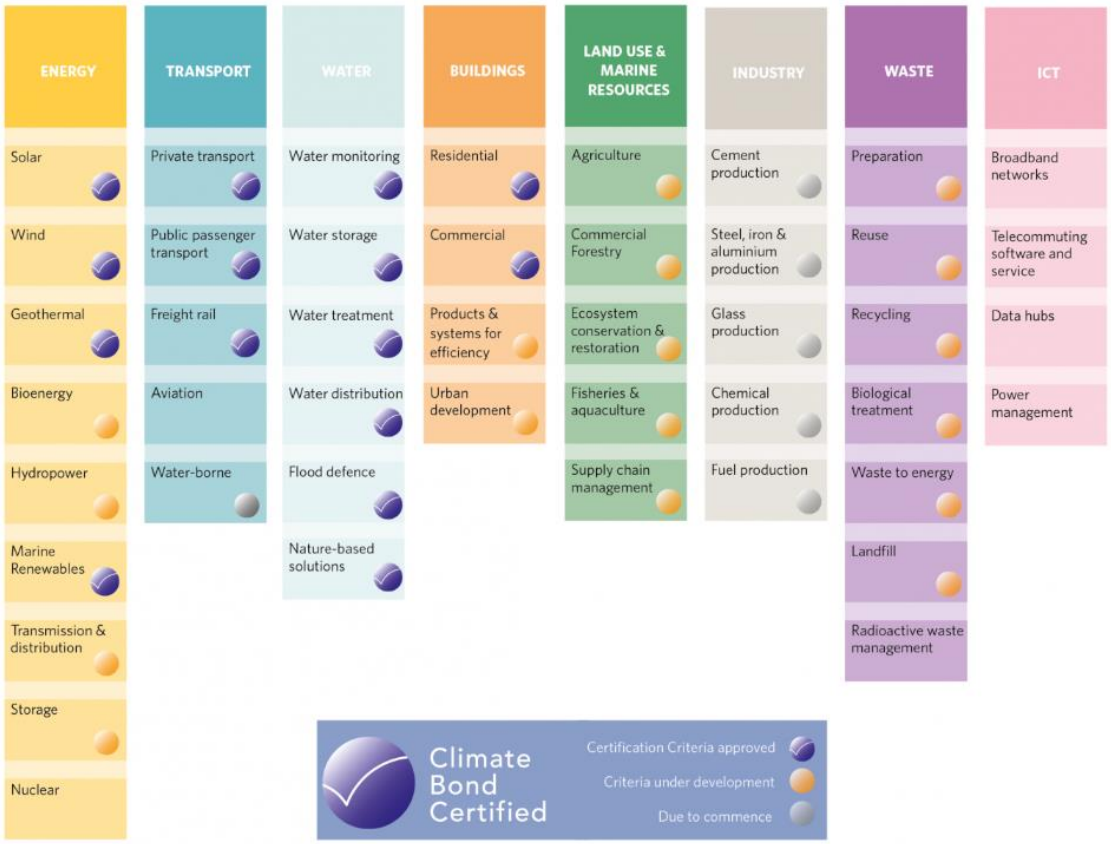
3.3.1 Climate Bonds

At the risk of oversimplifying, and within the context of this report, the original Green Bond[35] framework has been incorporated by the Climate Bond Initiative [36], which is itself

[31] https://www.pnas.org/content/pnas/114/24/6167.full.pdf
[32] https://www.wwf.org.uk/sites/default/files/2018-06/North%20Devon%20sustainable%20finance%20mechanisms%20report%20FINAL.pdf,
[33] https://www.oecd-ilibrary.org/environment/marine-protected-areas/sustainable-financing-of-marine-protected-areas_9789264276208-7-en
[34] http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en
[35] https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/June-2018/Green-Bond-Principles---June-2018-140618-WEB.pdf
[36] https://www.climatebonds.net/

being used as the basis for a green bond taxonomy by the European Union[37]. This taxonomy is summarised in Figure 5 below:

Figure 5: Climate Bonds Taxonomy[38]



For each of the categories where certification criteria have already been approved, a detailed definition has been developed which sets out the framework for estimations of green impact, minimum requirements for project quality, governance, reporting and so forth. Although the Climate Bonds Initiative (CBI) focusses on climate-related investments, there is potential for the EU taxonomy to expand the scope to include biodiversity, natural capital and environmental sustainability projects, although this does not currently appear to be a priority (there are 56 mentions of "climate" in the Technical Expert Group report and only 2 of biodiversity, both of which are in the context of the impact of climate change on biodiversity).

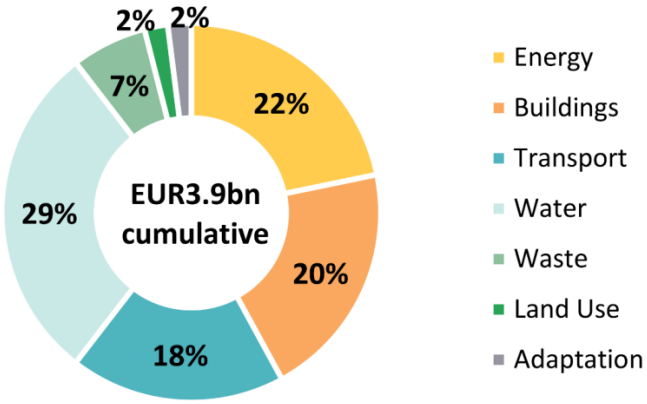
Nonetheless, these developments would appear to present opportunities for more diverse investments in those areas where criteria are under development. In context, these are principally those under the Land Use & Marine Resources heading. Specifications for these categories are still under development, so we have not been

[37] https://goo.gl/ygguKc
[38] https://www.climatebonds.net/standard/taxonomy

able to establish what they might look like. It is likely that CBI certification will require a higher quality of justification and transparency but it will not get around the problem of how to generate revenue from such investments, particularly in the developed world.

Figure 6 below shows the proportion of green bonds issued across Europe in the above categories to 2018. Land Use & Marine Resources represents just 2% of total investment.

Figure 6: Green Bond Investment Areas in Europe, 2018



Source: The Green Bond Market in Europe, 2018. Climate Bonds Initiative

As well as green and climate bonds, there are social bonds[39] (which tend to focus on affordable housing, education, healthcare, services and food security) and sustainability bonds[40] which combine green and social elements.

Sustainability bonds are often couched in the framework of the United Nations Sustainable Development Goals (SDGs). The following section describes how this approach might be used to encourage diversification in investment at GIG.

3.3.2 SDG bonds

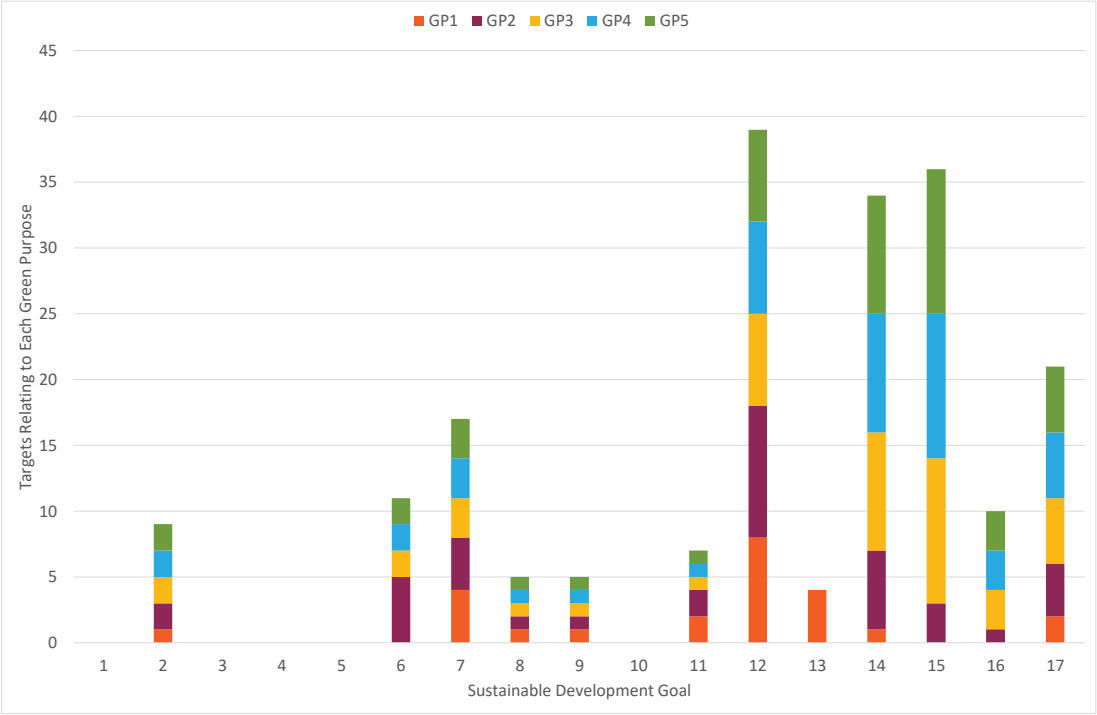
The UN SDGs are usually depicted as shown below, with 17 headline categories.

[39] https://www.icmagroup.org/green-social-and-sustainability-bonds/social-bond-principles-sbp/
[40] https://www.icmagroup.org/green-social-and-sustainability-bonds/sustainability-bond-guidelines-sbg/

Figure 7: Headline Sustainable Development Goals[41]

The relationship between SDGs and Green Purposes is summarised in Figure 8 below:

Figure 8: Frequency of SDG Targets Relating to GPs



According to research by French investment bank Natixis, the proportion of SDGs mentioned in bond investment prospectuses is as shown below (NB: this is not weighted by investment, only by focus of investment).

[41] https://www.un.org/sustainabledevelopment/sustainable-development-goals/

Figure 9: Proportion of investment by Sustainable Development Goal

Source: Environmental Finance Green, Social and Sustainability Bond Database, graphic by Natixis

This shows that bonds are focussed on energy, climate, industry and infrastructure; in short, on continuing current economic activity while reducing its environmental impact.

However, the mapping exercise shows that benefits to Green Purposes 3-5 can be realised by projects which focus on these SDGs, as much as those relating directly to biodiversity, natural capital and environmental sustainability. As before, if the only way for an investment to generate revenue is through energy sales or carbon sequestration, that does not necessarily mean that it will not benefit biodiversity.

However, to ensure that such investments are beneficial, it may be necessary to tighten the Green Purposes, so that they require more than just "doing no harm."

3.3.3 ISO 14030

The International Standards Organisation decided in 2015 that green bonds needed a unifying standard to build on the early foundations provided by the Green Bond Principles, the Climate Bond Standard and the variety of existing taxonomies for green bonds – and so eliminate the risk of multiplying regional standards and fracturing the market.

ISO 14030 is currently under development but will draw upon the Green Bond Principles and the Climate Bond Initiative's Climate Bond Standard, which is based on these principles. The standard's working group of experts is also considering the taxonomy for green bonds developed through a joint effort of the Green Finance Committee of the China Society for Finance and Banking and the European Investment Bank.

When released, ISO14030 will provide a global taxonomy and framework for green bonds, linked to other ISO 14000-series standards, such as ISO 14064 (measuring, quantifying and reducing greenhouse gas emissions).

4.0 Conclusions

This study set out to map the landscape of green investments in areas relating to the five Green Purposes, first among GIG's peers, then similar institutions and finally, any investments at all. In general terms, perhaps unsurprisingly, the study has found that investments are made where returns are available. Returns are available from renewable energy generation and energy-from-waste because long-term contracts are available for the supply of energy and waste services. For biodiversity, natural capital and environmental sustainability investments, direct revenue streams are not so readily available but such opportunities do exist.

Research into similar institutions and green investments more generally shows that there may be potential for GIG to expand its portfolio to include projects which address greenhouse gas emissions and resource efficiency in more diverse ways, and to deliver a positive impact for the natural environment, biodiversity and environmental sustainability.