# The Global Green Finance Index 4

**September 2019**

We are pleased to present the fourth edition of the Global Green Finance Index (GGFI 4).

The GGFI has been developed jointly by Z/Yen, as part of its Long Finance Initiative, and Finance Watch. We are grateful to the MAVA Foundation for its sponsorship of this work.

Founded by the late Dr Luc Hoffmann in 1994, **MAVA** is a Swiss-based philanthropic foundation with a focus on biodiversity conservation.  Running three region-based programmes in Switzerland, the Mediterranean, and West Africa, and a fourth programme focused on Sustainable Economy, MAVA works through partnerships with international, national, and local NGOs, research institutions and universities, and occasionally with government bodies or individuals.

**Finance Watch** is a European, not-for-profit association of civil society members, dedicated to making finance work for the good of society.  Finance Watch works for a financial system that allocates capital to productive use through fair and open markets, in a transparent and sustainable manner without exploiting or endangering society at large.

**Z/Yen** helps organisations make better choices - our clients consider us a commercial think-tank that spots, solves, and acts. Our name combines Zen and Yen - 'a philosophical desire to succeed' - in a ratio, recognising that all decisions are trade-offs.  One of Z/Yen's specialisms is the development and publication of research combining factor analysis and professional assessments.

**Long Finance** is a Z/Yen initiative designed to address the question **"When would we know our financial system is working?"**  This question underlies Long Finance's goal to improve society's understanding and use of finance over the long-term.  In contrast to the short-termism that defines today's economic views the Long Finance time-frame is roughly 100 years.

The authors of this report, Mike Wardle, Greg Ford, Benoît Lallemand, Professor Michael Mainelli, and Simon Mills would like to thank Bikash Kharel, Mark Yeandle, and the rest of the Z/Yen and Finance Watch teams for their contributions with research, modelling, and ideas.

# Contents

# Foreword

Climate change is one of the most critical issues facing humankind today. As detailed in the 2018 Intergovernmental Panel on Climate Change Special Report, it is already affecting many industries and regions globally, and the impacts of global warming will continue to increase.

Economists have described climate change as a global market failure estimating that without action, the rising overall costs of climate could result to losing at least 5% of global GDP each year.  While climate-related risks are clear, the transition to a low-carbon economy also presents opportunities.  Recent research suggests that mitigating climate change can deliver high rates of return, while bringing multiple benefits to both economy and society.

A growing number of financial institutions is joining in a constructive dialogue on the relation between economic development, environmental protection and sustainable development.  Financial institutions, including banks, insurers, and investors, work with the United Nations Environment Programme - Finance Initiative to better understand environmental, social and governance challenges, why they matter to finance, and how to take steps to address them.  For instance, in December 2015, over 120 investors from across the globe representing more than $10 trillion in assets under management signed the Montreal Carbon Pledge, a commitment by institutional investors to annually measure and publicly disclose their portfolio's carbon footprint.

In 2017, Finance Montréal gathered 30 financial institutions representing $1.2 trillion in assets under management to sign the Declaration of Institutional investors on Climate-related Financial Risks, a call from the industry for greater disclosure to better manage the impact of climate change.

Through its Finance and Sustainability Initiative, Finance Montréal works with key players and stakeholders from Québec's financial services sector to go beyond responsible investment and foster the emergence of sustainable finance in order to differentiate Montréal and Québec at an international level, consolidate synergies within the ecosystem, and promote the financial centre globally.

I am pleased to introduce this fourth edition of the Global Green Finance Index (GGFI). The GGFI helps us get a better sense of the quality and  depth of financial centres across the world.  It also provides us a better understanding of a range of factors, both policy-driven and market-led, that are key to the growth and enrichment in sustainable finance practices.

**Louis Lévesque**
**Chief Executive Officer**
**Finance Montréal**

# Summary And Headlines

**Overview**

Welcome to the fourth edition of the Global Green Finance Index (GGFI 4). The GGFI is based on a worldwide survey of finance professionals' assessments on the quality and depth of green finance offerings in financial centres. The online survey is at http://greenfinanceindex.net/survey. Please take a moment to take the survey if you have not recently done so: the survey runs continuously and is sampled for each edition of the GGFI.

We include in this edition of the GGFI a supplement on biodiversity, looking at the approach of the financial system to addressing the challenge of investment in natural resources and habitat and addressing the market failure in this area.

Awareness and concern about biodiversity risk within the financial services sector is still at an extremely low level, despite its potentially catastrophic impacts on financial asset values, the economy, and the planet. If finance is to help reduce biodiversity loss, policy makers must act quickly to embrace common environmental metrics and disclosure practices, develop tools to internalise environmental costs, encourage the flow of private finance to protect biodiversity, phase out environmentally-harmful subsidies, and increase public financing for 'unbankable' conservation projects. More detail can be found in the biodiversity supplement starting on page 33.

**Index Results**

- Ratings of green finance rose in almost all centres for both depth and quality. With one exception, all centres received a higher rating for quality than in GGFI 3. Average performance across the measures of green finance depth and quality increased, with the average rating rising 2.2% for depth and 3.8% for quality compared with GGFI 3.
- Western Europe continues to lead the world's centres in green finance depth and quality, taking eight of the top ten places in depth and all ten top places in quality. This may reflect the work being undertaken by the European Union on strategy, regulation, and measurement; and the work of central banks in Europe to embed sustainability in their regulatory work.
- The Asia/Pacific region has fallen back slightly in this edition.
- Amsterdam retained its leading position in the depth index, with Luxembourg regaining the ground it lost in GGFI 3 to take second place.
- London retained its position as first in the quality index, albeit with a smaller margin than before, with Amsterdam overtaking Paris to rank second. On current trends, London would lose its top ranking for quality within the next 12 months. It is worth noting that the UK has fallen behind a number of other countries by not yet issuing a sovereign green bond. This may affect perceptions.
- Several centres moved more than five places in the indices. Munich is up nine places in the depth index, with San Francisco and Rome also improving more than five places. Calgary, Liechtenstein and Kuala Lumpur rose more than five places for quality.

**Commentary**

The evidence in this report suggests that larger, well-established centres are not generally those which are rated highly as green financial centres.  For example, New York, which tops the ranking of financial centres competitiveness in the Global Financial Centres Index, and which has extensive green tech listings on its exchanges, ranks 41st for depth and 29th for quality in GGFI 4.

Our analysis comparing leading financial centres in the world against their green finance rankings (see Table 3) suggests that the overhang of brown financing in many traditional financial centres means that they are not recognised for their green finance.   Established centres are also assessed as having better quality than depth, which may reflect that their skills base is recognised, and that the green finance they are undertaking is of good quality.  But their lower ratings for depth suggests that green finance is not seen as a mainstream activity in these centres.

Recent data on the scale of the environmental challenge, including support for biodiversity from the UN, the Green Economy Coalition, and others has highlighted the need for increased volumes of green financing.  Our analysis shows the scale of the challenge for larger, established centres, which have a legacy of brown finance.

It is not only in the leading global centres where this effect is seen.  Johannesburg has strong sustainability credentials overall, but ranks 58th and 50th in GGFI 4.

The improvement in ratings for both depth and quality in the latest index suggests that respondents to our survey are showing more interest in green finance; and confidence that green finance is moving more towards the mainstream - although there is a long way to go.  It is unclear what is driving this shift in perception.  Possible causes include:
• the view that more finance is falling into the green category or that there is a hope expressed that it should do so; and
• growing awareness of green finance as the evidence of the impact of climate change continues to build.

Over the four editions of the GGFI, the correlation between the instrumental factors we use to compile the index and the overall results has increased.  The GGFI results are converging towards other well-established measures across a range of areas of competitiveness.  This may reflect the maturity of the index and the changing perceptions of how a range of quantitative factors, not only sustainability measures but also human capital, infrastructure and business environment, affect financial centre performance in green finance.  The leading factors by correlation with both depth and quality are:
• the Arcadis Sustainable Cities Index;
• the Mercer Quality of Living City Rankings;
• the Yale Environmental Performance Index;
• the OECD Water Quality Index;
• the IMD World Talent Rankings; and
• the Ericsson Networked Society City Index.

Overall, momentum continues to build on green finance. Perceptions of depth and quality as measured by assessments have increased and green finance, alongside sustainable city development, may be gaining ground. Composite indices that measure sustainable city development, while not measuring green finance directly, are increasingly closely correlated with the perception of green finance performance. The cause of this is likely to be general awareness of environmental issues, making it more difficult to be a leader in a city which is seen not to be focussed on sustainability. It is clear that for centres to perform well in the GGFI, there is a need for a sustainable city environment, perhaps developed through green finance.

**Leading Centres**

- On depth, the top ten centres all stayed in the top group, with some minor adjustments in placing. Hamburg continued to progress, moving up three places in the rankings to equal seventh with Paris. Zürich fell three places to fifth following a sharp rise in GGFI 3.
- On quality, Brussels displaces Geneva to move into the top 10. London's lead in the quality index has reduced from 52 in GGFI 1 to 18 in GGFI 4 .
- Narrow margins continue to separate centres at top of the tables. Among the top ten centres the spread of ratings is 47 out of 1,000 for depth (37 in GGFI 3) and 53 for quality (60 in GGFI 3).

**Western Europe**

- Western Europe continues to improve its ratings across depth and quality, with all but one centre receiving improved ratings for both depth and quality.
- Munich rose nine places to 11th in the depth index, while Rome improved six places to 31st.
- Liechtenstein gained eight places in the quality index.
- Milan, Dublin, and Guernsey fell in the rankings for both depth and quality.

**North America**

- San Francisco was again the leading centre for quality in North America, retaining its 11th place in the index. It also increased its ranking by seven places to 17th in the depth index. Montréal again took first place in the region for depth, at ninth position overall and rose five places to 13th overall for quality.
- Calgary and Chicago both improved their position in the rankings for both depth and quality.
- Canadian centres continue to outperform the USA both in depth and quality.

**Asia/Pacific**

- Asia/Pacific centres overall fell back in the rankings for both depth and quality, even though ratings improved slightly overall, meaning that other centres improved their performance at a faster rate.
- Shanghai retained its leading position in the region for depth, with Guangzhou improving five places in the depth rankings to 17th overall.
- Melbourne and Sydney lead the region for quality.

**Middle East & Africa**

- Casablanca consolidated its reputation as the regional leader, retaining its 13th place in the overall rankings for depth and placing 17th in quality.
- New entrant Tel Aviv took second place in the region and ranked 30th for depth and 25th for quality.
- Other centres in the region generally lost ground in the rankings, although ratings generally improved.

**Latin America & The Caribbean**

- São Paulo retained its leading position in the region and rose three places in the rankings for quality. Further analysis of the city's approach is contained in the GGFI São Paulo case study published in May 2019.  Cayman Islands rose to second place in the region for depth.
- The British Virgin Islands and Mexico City fell in the rankings for both depth and quality.

**Eastern Europe & Central Asia**

- Prague consolidated its position as the regional leader and retained its ranking at 22nd overall for quality.
- Warsaw fell in both the depth and quality rankings; and Istanbul and Moscow both improved their position in the depth rankings.

**Areas Of Interest, Areas With Most Impact On Sustainability, And Drivers Of Green Finance**

We asked respondents which areas of green finance were of most interest; which areas would have most impact on sustainability; and which factors are driving the uptake of green finance:

- Renewable energy investment, green bonds, and sustainable infrastructure finance remained the three areas identified as both most interesting and with most impact. This has been a consistent finding in all four editions of the GGFI.
- Natural capital valuation is mentioned least often both in terms of interest and impact, despite recent reports from the United Nations and the Intergovernmental Platform On Biodiversity And Ecosystem Services highlighting the severe risks to society resulting from the destruction of biodiversity.  Our special report on biodiversity in this edition of the GGFI unpicks the fundamental failing of markets which have led to a systemic failure to value natural capital.
- The drivers of green finance are consistently identified as:
  - the policy and regulatory framework, followed by mandatory disclosure, and tax incentives; and
  - demand from investors, and public awareness of climate change.

**GGFI 4**

GGFI 4 was compiled using 132 instrumental factors.  These quantitative measures are provided by third parties including the World Bank, The Economist Intelligence Unit, the OECD, and the United Nations.  Details can be found in Appendix 5.

The instrumental factors were combined with 4,220 financial centre assessments provided by respondents to the GGFI online questionnaire.  A breakdown of the 735 respondents is shown in Appendix 3.  Further details of the methodology behind GGFI 4 are in Appendix 4.

We researched 114 financial centres for this edition of the index.  The 64 centres listed in GGFI 4 are those which received a minimum of 20 assessments from survey respondents.  Assessments of respondents' home centres were excluded from the data, in order to avoid home centre bias.  For comparison, GGFI 3 collected survey data on 112 financial centres, of which 63 received enough responses to be included.

# GGFI 4 Ranks And Ratings

**Table 1 | Ranks And Ratings Of The Depth Of Green Finance**

| Centre | GGFI 4 | | GGFI 3 | | Change in Rank | | Change in Rating | |
|---|---|---|---|---|---|---|---|---|
| | Rank | Rating | Rank | Rating | | | | |
| Amsterdam | 1 | 471 | 1 | 461 | ▶ | 0 | ▲ | 10 |
| Luxembourg | 2 | 459 | 4 | 444 | ▲ | 2 | ▲ | 15 |
| Copenhagen | 3 | 455 | 2 | 448 | ▼ | -1 | ▲ | 7 |
| Stockholm | 4 | 453 | 5 | 442 | ▲ | 1 | ▲ | 11 |
| Zürich | 5 | 452 | 2 | 448 | ▼ | -3 | ▲ | 4 |
| London | 6 | 447 | 5 | 442 | ▼ | -1 | ▲ | 5 |
| Paris | 7= | 440 | 7 | 435 | ▶ | 0 | ▲ | 5 |
| Hamburg | 7= | 440 | 10 | 424 | ▲ | 3 | ▲ | 16 |
| Montréal | 9 | 437 | 8 | 431 | ▼ | -1 | ▲ | 6 |
| Vancouver | 10 | 424 | 9 | 429 | ▼ | -1 | ▼ | -5 |
| Shanghai | 11= | 422 | 11 | 420 | ▶ | 0 | ▲ | 2 |
| Munich | 11= | 422 | 20 | 407 | ▲ | 9 | ▲ | 15 |
| Casablanca | 13= | 420 | 13 | 417 | ▶ | 0 | ▲ | 3 |
| Toronto | 13= | 420 | 17 | 410 | ▲ | 4 | ▲ | 10 |
| Sydney | 15= | 419 | 13 | 417 | ▼ | -2 | ▲ | 2 |
| Geneva | 15= | 419 | 15 | 412 | ▶ | 0 | ▲ | 7 |
| Guangzhou | 17= | 416 | 22 | 405 | ▲ | 5 | ▲ | 11 |
| San Francisco | 17= | 416 | 24 | 402 | ▲ | 7 | ▲ | 14 |
| Beijing | 19 | 415 | 12 | 418 | ▼ | -7 | ▼ | -3 |
| Brussels | 20 | 414 | 17 | 410 | ▼ | -3 | ▲ | 4 |
| Shenzhen | 21= | 413 | 15 | 412 | ▼ | -6 | ▲ | 1 |
| Seoul | 21= | 413 | 20 | 407 | ▼ | -1 | ▲ | 6 |
| Jersey | 21= | 413 | 25 | 399 | ▲ | 4 | ▲ | 14 |
| Singapore | 24 | 412 | 23 | 404 | ▼ | -1 | ▲ | 8 |
| Melbourne | 25 | 411 | 19 | 409 | ▼ | -6 | ▲ | 2 |
| Frankfurt | 26= | 406 | 25 | 399 | ▼ | -1 | ▲ | 7 |
| Edinburgh | 26= | 406 | 27 | 393 | ▲ | 1 | ▲ | 13 |
| Vienna | 26= | 406 | 27 | 393 | ▲ | 1 | ▲ | 13 |
| Los Angeles | 29 | 405 | 29 | 392 | ▶ | 0 | ▲ | 13 |
| Tel Aviv | 30 | 401 | New | New | New | | New | |
| Rome | 31 | 400 | 37 | 379 | ▲ | 6 | ▲ | 21 |
| Tokyo | 32 | 399 | 34 | 382 | ▲ | 2 | ▲ | 17 |

**Table 1 (continued) | Ranks And Ratings Of The Depth Of Green Finance**

| Centre | GGFI 4 | | GGFI 3 | | Change in Rank | | Change in Rating | |
|---|---|---|---|---|---|---|---|---|
| | Rank | Rating | Rank | Rating | | | | |
| Washington DC | 33 | 397 | 31 | 385 | ▼ | -2 | ▲ | 12 |
| Boston | 34 | 393 | 35 | 380 | ▲ | 1 | ▲ | 13 |
| Hong Kong | 35 | 392 | 31 | 385 | ▼ | -4 | ▲ | 7 |
| Calgary | 36 | 391 | 38 | 376 | ▲ | 2 | ▲ | 15 |
| Isle of Man | 37 | 390 | 40 | 374 | ▲ | 3 | ▲ | 16 |
| Dublin | 38 | 388 | 33 | 384 | ▼ | -5 | ▲ | 4 |
| Milan | 39 | 387 | 35 | 380 | ▼ | -4 | ▲ | 7 |
| Madrid | 40 | 385 | 30 | 389 | ▼ | -10 | ▼ | -4 |
| New York | 41 | 381 | 38 | 376 | ▼ | -3 | ▲ | 5 |
| Chicago | 42 | 379 | 47 | 358 | ▲ | 5 | ▲ | 21 |
| Mauritius | 43 | 376 | 41 | 372 | ▼ | -2 | ▲ | 4 |
| Malta | 44= | 375 | 44 | 367 | ▶ | 0 | ▲ | 8 |
| Prague | 44= | 375 | 43 | 369 | ▼ | -1 | ▲ | 6 |
| São Paulo | 46 | 374 | 46 | 366 | ▶ | 0 | ▲ | 8 |
| Guernsey | 47 | 371 | 44 | 367 | ▼ | -3 | ▲ | 4 |
| Cape Town | 48 | 367 | 42 | 371 | ▼ | -6 | ▼ | -4 |
| Liechtenstein | 49 | 362 | 48 | 357 | ▼ | -1 | ▲ | 5 |
| Abu Dhabi | 49 | 362 | 52 | 349 | ▲ | 3 | ▲ | 13 |
| Moscow | 51 | 361 | 56 | 341 | ▲ | 5 | ▲ | 20 |
| Dubai | 52 | 360 | 49 | 353 | ▼ | -3 | ▲ | 7 |
| Warsaw | 53 | 359 | 50 | 352 | ▼ | -3 | ▲ | 7 |
| Cayman Islands | 54 | 356 | 56 | 341 | ▲ | 2 | ▲ | 15 |
| Rio de Janeiro | 55= | 353 | 55 | 344 | ▶ | 0 | ▲ | 9 |
| Kuala Lumpur | 55= | 353 | 58 | 335 | ▲ | 3 | ▲ | 18 |
| Istanbul | 57 | 350 | 60 | 329 | ▲ | 3 | ▲ | 21 |
| Johannesburg | 58= | 349 | 51 | 350 | ▼ | -7 | ▼ | -1 |
| Mexico City | 58= | 349 | 53 | 345 | ▼ | -5 | ▲ | 4 |
| Bermuda | 60 | 336 | 61 | 326 | ▲ | 1 | ▲ | 10 |
| British Virgin Islands | 61 | 335 | 53 | 345 | ▼ | -8 | ▼ | -10 |
| Mumbai | 62 | 334 | 63 | 315 | ▲ | 1 | ▲ | 19 |
| New Delhi | 63 | 333 | 62 | 322 | ▼ | -1 | ▲ | 11 |
| Bangkok | 64 | 332 | 59 | 332 | ▼ | -5 | ▶ | 0 |

**Table 2 | Ranks And Ratings Of Green Finance Quality**

| Centre | GGFI 4 | | GGFI 3 | | Change in Rank | | Change in Rating | |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Rank | Rating | Rank | Rating | | | | |
| London | 1 | 497 | 1 | 491 | ▶ | 0 | ▲ | 6 |
| Amsterdam | 2 | 479 | 3 | 461 | ▲ | 1 | ▲ | 18 |
| Paris | 3 | 477 | 2 | 462 | ▼ | -1 | ▲ | 15 |
| Hamburg | 4 | 476 | 4 | 459 | ▶ | 0 | ▲ | 17 |
| Zürich | 5 | 473 | 5 | 458 | ▶ | 0 | ▲ | 15 |
| Copenhagen | 6 | 466 | 7 | 452 | ▲ | 1 | ▲ | 14 |
| Stockholm | 7= | 465 | 6 | 453 | ▼ | -1 | ▲ | 12 |
| Luxembourg | 7= | 465 | 8 | 450 | ▲ | 1 | ▲ | 15 |
| Munich | 9 | 458 | 9 | 441 | ▶ | 0 | ▲ | 17 |
| Brussels | 10 | 444 | 12 | 427 | ▲ | 2 | ▲ | 17 |
| Geneva | 11= | 443 | 10 | 431 | ▼ | -1 | ▲ | 12 |
| San Francisco | 11= | 443 | 11 | 429 | ▶ | 0 | ▲ | 14 |
| Montréal | 13 | 438 | 18 | 416 | ▲ | 5 | ▲ | 22 |
| Vancouver | 14 | 435 | 13 | 425 | ▼ | -1 | ▲ | 10 |
| Edinburgh | 15= | 433 | 14 | 424 | ▼ | -1 | ▲ | 9 |
| Melbourne | 15= | 433 | 17 | 417 | ▲ | 2 | ▲ | 16 |
| Casablanca | 17= | 432 | 15 | 422 | ▼ | -2 | ▲ | 10 |
| Sydney | 17= | 432 | 16 | 418 | ▼ | -1 | ▲ | 14 |
| Vienna | 19 | 428 | 20 | 414 | ▲ | 1 | ▲ | 14 |
| Toronto | 20 | 426 | 20 | 414 | ▶ | 0 | ▲ | 12 |
| Singapore | 21 | 424 | 23 | 408 | ▲ | 2 | ▲ | 16 |
| Prague | 22= | 420 | 22 | 413 | ▶ | 0 | ▲ | 7 |
| Frankfurt | 22= | 420 | 23 | 408 | ▲ | 1 | ▲ | 12 |
| Tokyo | 24 | 419 | 28 | 404 | ▲ | 4 | ▲ | 15 |
| Beijing | 25= | 418 | 25 | 406 | ▶ | 0 | ▲ | 12 |
| Madrid | 25= | 418 | 26 | 405 | ▲ | 1 | ▲ | 13 |
| Tel Aviv | 25= | 418 | New | New | New | | New | |
| Shanghai | 28 | 417 | 19 | 415 | ▼ | -9 | ▲ | 2 |
| New York | 29 | 416 | 32 | 399 | ▲ | 3 | ▲ | 17 |
| Washington DC | 30 | 415 | 30 | 401 | ▶ | 0 | ▲ | 14 |
| Shenzhen | 31= | 412 | 29 | 403 | ▼ | -2 | ▲ | 9 |
| Milan | 31= | 412 | 30 | 401 | ▼ | -1 | ▲ | 11 |

## Table 2 (continued) | Ranks And Ratings Of Green Finance Quality

| Centre | GGFI 4 | | GGFI 3 | | Change in Rank | | Change in Rating | |
|---|---|---|---|---|---|---|---|---|
| | Rank | Rating | Rank | Rating | | | | |
| Dublin | 33= | 408 | 26 | 405 | ▼ | -7 | ▲ | 3 |
| Los Angeles | 33= | 408 | 34 | 392 | ▲ | 1 | ▲ | 16 |
| Jersey | 35= | 406 | 32 | 399 | ▼ | -3 | ▲ | 7 |
| Boston | 35= | 406 | 35 | 391 | ▶ | 0 | ▲ | 15 |
| Calgary | 37 | 404 | 45 | 370 | ▲ | 8 | ▲ | 34 |
| Malta | 38 | 401 | 41 | 376 | ▲ | 3 | ▲ | 25 |
| Guangzhou | 39 | 400 | 36 | 386 | ▼ | -3 | ▲ | 14 |
| Hong Kong | 40 | 399 | 37 | 385 | ▼ | -3 | ▲ | 14 |
| Chicago | 41 | 393 | 42 | 374 | ▲ | 1 | ▲ | 19 |
| Liechtenstein | 42 | 392 | 50 | 367 | ▲ | 8 | ▲ | 25 |
| São Paulo | 43 | 390 | 46 | 369 | ▲ | 3 | ▲ | 21 |
| Guernsey | 44= | 388 | 38 | 382 | ▼ | -6 | ▲ | 6 |
| Seoul | 44= | 388 | 46 | 369 | ▲ | 2 | ▲ | 19 |
| Cape Town | 46= | 387 | 39 | 381 | ▼ | -7 | ▲ | 6 |
| Isle of Man | 46= | 387 | 43 | 372 | ▼ | -3 | ▲ | 15 |
| Warsaw | 48 | 386 | 39 | 381 | ▼ | -9 | ▲ | 5 |
| Mauritius | 49 | 379 | 49 | 368 | ▶ | 0 | ▲ | 11 |
| Johannesburg | 50= | 378 | 46 | 369 | ▼ | -4 | ▲ | 9 |
| Rome | 50= | 378 | 51 | 357 | ▲ | 1 | ▲ | 21 |
| Cayman Islands | 50= | 378 | 52 | 346 | ▲ | 2 | ▲ | 32 |
| Dubai | 53 | 372 | 43 | 372 | ▼ | -10 | ▶ | 0 |
| Kuala Lumpur | 54 | 359 | 63 | 313 | ▲ | 9 | ▲ | 46 |
| Abu Dhabi | 55= | 358 | 52 | 346 | ▼ | -3 | ▲ | 12 |
| Rio de Janeiro | 55= | 358 | 56 | 339 | ▲ | 1 | ▲ | 19 |
| British Virgin Islands | 57 | 357 | 54 | 342 | ▼ | -3 | ▲ | 15 |
| Istanbul | 58 | 354 | 58 | 334 | ▶ | 0 | ▲ | 20 |
| Mexico City | 59 | 351 | 55 | 340 | ▼ | -4 | ▲ | 11 |
| Mumbai | 60 | 349 | 61 | 323 | ▲ | 1 | ▲ | 26 |
| Bangkok | 61 | 348 | 57 | 337 | ▼ | -4 | ▲ | 11 |
| Moscow | 62 | 346 | 59 | 331 | ▼ | -3 | ▲ | 15 |
| Bermuda | 63 | 342 | 62 | 318 | ▼ | -1 | ▲ | 24 |
| New Delhi | 64 | 334 | 60 | 328 | ▼ | -4 | ▲ | 6 |

# Depth And Quality

Chart 1 shows the relationship between ratings of depth and quality in the index and shows the generally close correlation between the assessments of each factor by respondents, though it also shows that some major, long-established financial centres such as New York, London, Paris, and Hamburg score higher for quality than depth; while for more specialist centres such as Luxembourg, Copenhagen, and Stockholm, the reverse is true.

**Chart  1 | Relationship Between Ratings Of Depth And Quality**



> *"In Nigeria, the regulatory environment could be better. The key sources of capital markets financing are the Pension Fund Administrators - It would help if more guidelines from the regulator – the National Pension Commission (Pencom) -  encouraged investment in sustainable finance instruments; for example, a mandatory allocation from their portfolios would help foster the market and increase their participation in green capital."*

**Senior Investment Banker, Lagos**

## Chart 2 | Combined Depth And Quality Ratings

**Combined Depth And Quality Rating**

| Centre | Rating |
| --- | --- |
| Amsterdam | 950 |
| London | 944 |
| Zurich | 925 |
| Luxembourg | 924 |
| Copenhagen | 921 |
| Stockholm | 918 |
| Paris | 917 |
| Hamburg | 916 |
| Munich | 880 |
| Montreal | 875 |
| Geneva | 862 |
| San Francisco | 859 |
| Vancouver | 859 |
| Brussels | 858 |
| Casablanca | 852 |
| Sydney | 851 |
| Toronto | 846 |
| Melbourne | 844 |
| Edinburgh | 839 |
| Shanghai | 839 |
| Singapore | 836 |
| Vienna | 834 |
| Beijing | 833 |
| Frankfurt | 826 |
| Shenzhen | 825 |
| Tel Aviv | 819 |
| Jersey | 819 |
| Tokyo | 818 |
| Guangzhou | 816 |
| Los Angeles | 813 |
| Washington DC | 812 |
| Madrid | 803 |
| Seoul | 801 |
| Milan | 799 |
| Boston | 799 |
| New York | 797 |
| Dublin | 796 |
| Prague | 795 |
| Calgary | 795 |
| Hong Kong | 791 |
| Rome | 778 |
| Isle of Man | 777 |
| Malta | 776 |
| Chicago | 772 |
| Sao Paulo | 764 |
| Guernsey | 759 |
| Mauritius | 755 |
| Liechtenstein | 754 |
| Cape Town | 754 |
| Warsaw | 745 |
| Cayman Islands | 734 |
| Dubai | 732 |
| Johannesburg | 727 |
| Abu Dhabi | 720 |
| Kuala Lumpur | 712 |
| Rio de Janeiro | 711 |
| Moscow | 707 |
| Istanbul | 704 |
| Mexico City | 700 |
| British Virgin Islands | 692 |
| Mumbai | 683 |
| Bangkok | 680 |
| Bermuda | 678 |
| New Delhi | 667 |

■ Depth ■ Quality

For the first time in GGFI 4, we have looked at the overall ratings if we combine centres' scores for depth and quality. The results are shown in Chart 2.

Zürich comes third on this analysis, demonstrating consistency across depth and quality, while Paris, Hamburg, and London will need to work on the depth of their offering to improve their overall ranking.

> *"Mandatory or voluntary is the question. Jurisdictions are less likely to implement mandatory reporting as it makes them less competitive unless there is a quantum shift with all jurisdictions on a level playing field. The regulatory environment needs to encourage a comply or explain message and let the investors be the ones to drive change. This is being seen with investors dictating investments must be sustainable and ethical. Organisations must now consider what is known as a 'triple bottom line' (TBL) when it comes to producing financial statements for their company. The three components: environmental sustainability, social responsibility as well as profit."*
>
> **Director, Financial Services Firm, Guernsey**

# Regional Performance

The top five centres in each region on average increased their ratings between GGFI 1 and GGFI 4 for depth. The leading North American centres, led by Canadian centres, overtook Asia/Pacific centres. The average for leading centres in Latin America & The Caribbean and in the Middle East & Africa recovered after a dip in ratings in GGFI 3.

**Chart 3 |** **Average Ratings For Depth Of The Top Five Centres In Each Region**
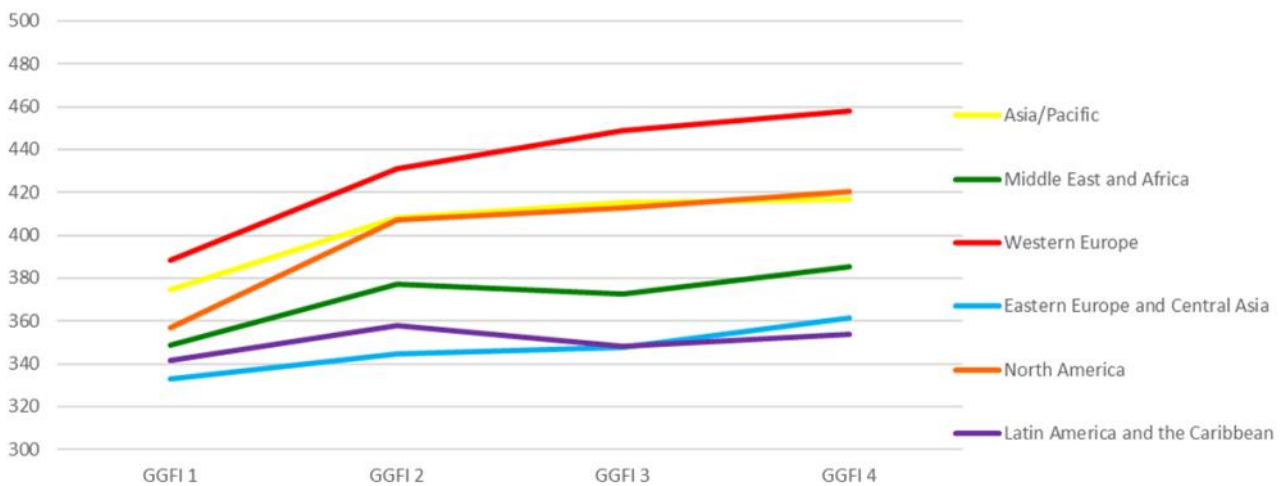


A similar picture is shown for the quality measure, with improvements in all regions between GGFI 3 and GGFI 4.

**Chart 4 |** **Average Ratings For Quality Of The Top Five Centres In Each Region**
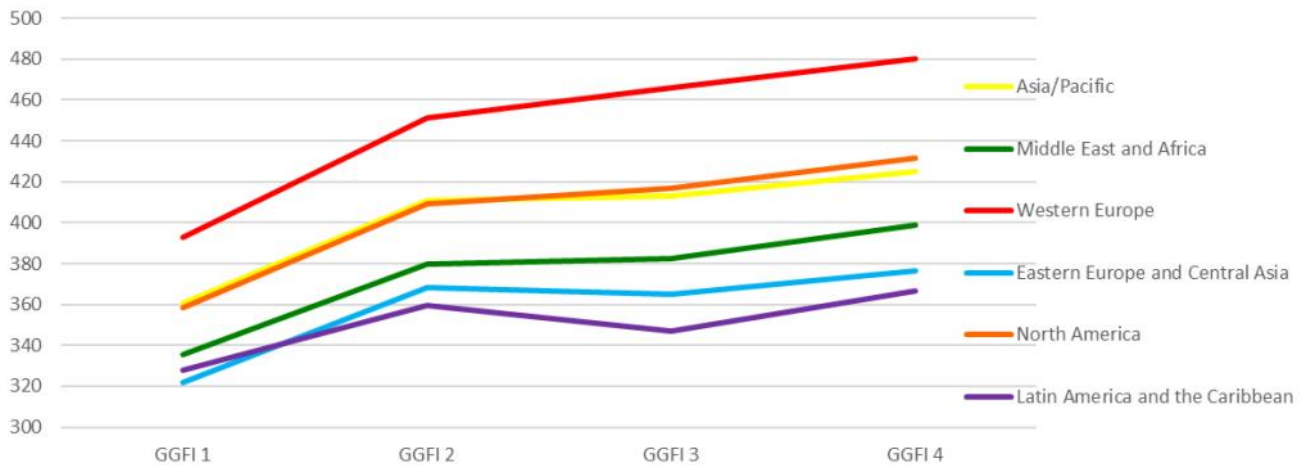
# Top Five Centres

The top five centres in the index for depth improved their ratings in the first three editions of the GGFI, but ratings have levelled off in GGFI 4.

**Chart 5 |** **The Top Five Centres For Depth Over Time**
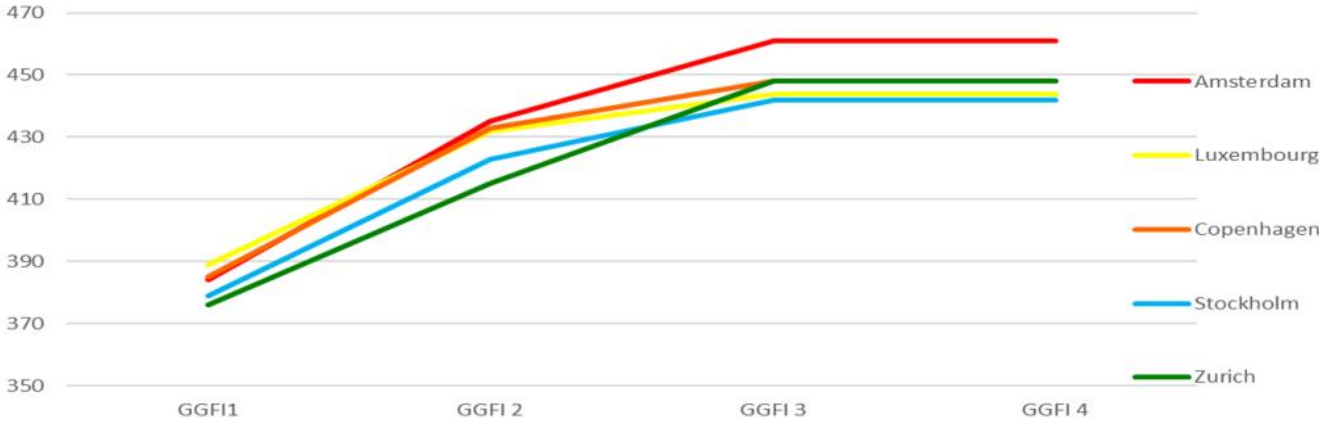


On the quality index, the top five centres have continued the improvement in their ratings, although the rate of increase for London has been slower than for the other leading centres. London is at risk of being overtaken by other centres over the next 12 months if this pattern continues.

**Chart 6 |** **The Top Five Centres For Quality Over Time**
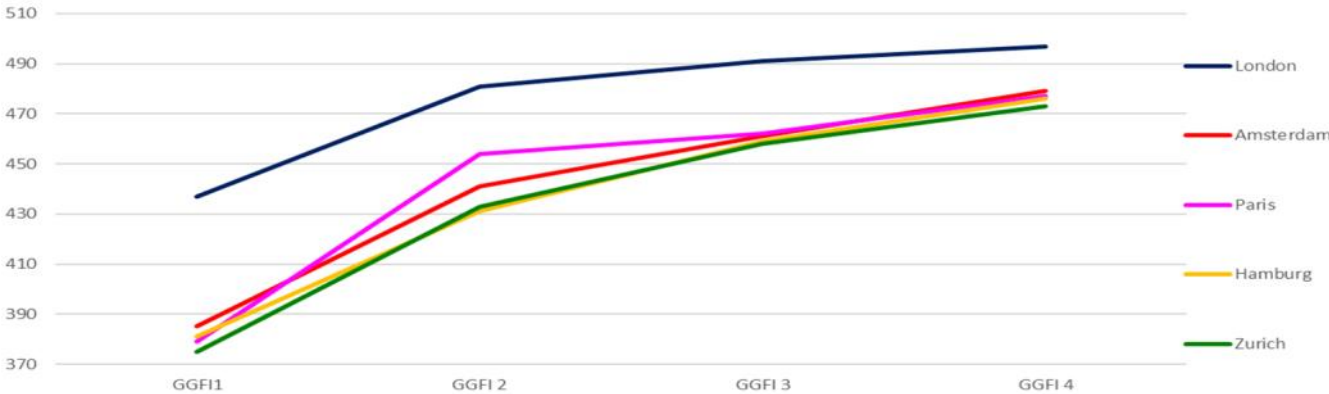
# Leading Financial Centres

It is notable that some leading financial centres perform less well than expected in the GGFI.  The Global Financial Centres Index (GFCI) has been measuring financial centre competitiveness since 2007.

We can compare the centres which rank in the top ten in each index.  The colours in Table 3 indicate the ranking in the indices.  This shows a clear disconnect between the highest performing centres in the GFCI and performance on green finance in the GGFI.  Only London features in the top ten in each index.

Historically, green finance has not been a leading factor in overall competitiveness as measured by the GFCI; and the legacy is that most of the leading centres in the GFCI are not green finance leaders.  This situation is not compatible with meeting the Paris targets and will have to change if the environmental challenge and the carbon risk highlighted in GGFI 3 is to be addressed.

London's placing in the indices shows it can be done.  We consider that competitive advantage will change towards green finance.  There is a role for leading centres and for political leadership across the world to use systems of tax and regulation to achieve the change.

**Table 3 | Leading Financial Centres - Comparison of GGFI And GFCI Rankings**

| Centre | Green Finance Depth | Green Finance Quality | Financial Centre Competitiveness |
|---|---|---|---|
| New York | 41 | 29 | 1 |
| London | 6 | 1 | 2 |
| Hong Kong | 35 | 40 | 3 |
| Singapore | 24 | 21 | 4 |
| Shanghai | 11 | 28 | 5 |
| Tokyo | 32 | 24 | 6 |
| Beijing | 19 | 25 | 7 |
| Dubai | 52 | 53 | 8 |
| Shenzhen | 21 | 31 | 9 |
| Sydney | 15 | 17 | 10 |
| Zurich | 5 | 5 | 14 |
| Paris | 7 | 3 | 17 |
| Montreal | 9 | 13 | 20 |
| Vancouver | 10 | 14 | 24 |
| Luxembourg | 2 | 7 | 25 |
| Amsterdam | 1 | 2 | 37 |
| Stockholm | 4 | 7 | 46 |
| Hamburg | 7 | 4 | 49 |
| Munich | 11 | 9 | 52 |
| Brussels | 20 | 10 | 56 |
| Copenhagen | 3 | 6 | 67 |
| Source | GGFI 4 Depth Rank | GGFI 4 Quality Rank | GFCI 26 Rank |

A further way to display the comparison between the GGFI and the GFCI is to examine that ratings for green finance depth and quality of the leading centres in the GFCI. The charts below show the leading ten centres in the current 26th edition of the Global Financial Centres Index and their ratings in the GGFI for depth and quality.

On the depth measure, London lead the ratings in this group for the GGFI, with Shanghai, Sydney, Beijing, and Singapore in a second group. Tokyo, and Hong Kong follow, with New York and finally Dubai, which take first and eighth place in the overall rankings in the Global Financial Centres Index.

**Chart 7 | Leading Financial Centres - Ratings Of Depth In The GGFI Over Time**
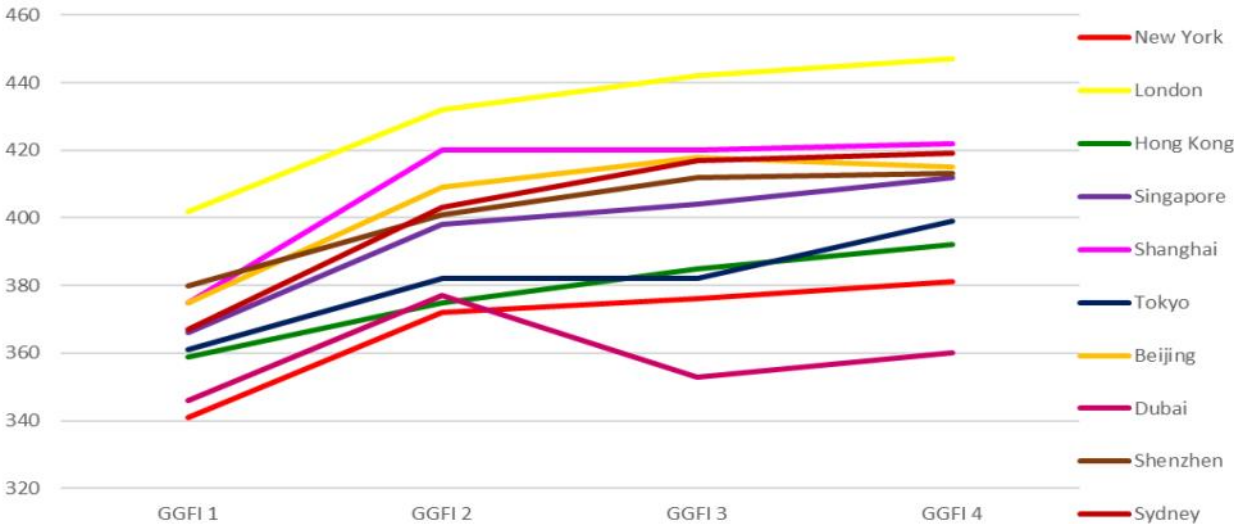


Turning to quality, a similar picture emerges as on quality, with London leading the ratings in the GGFI, with other leading centres in the Global Financial Centres Index some way behind.

**Chart 8 | Leading Financial Centres - Ratings Of Quality In The GGFI Over Time**
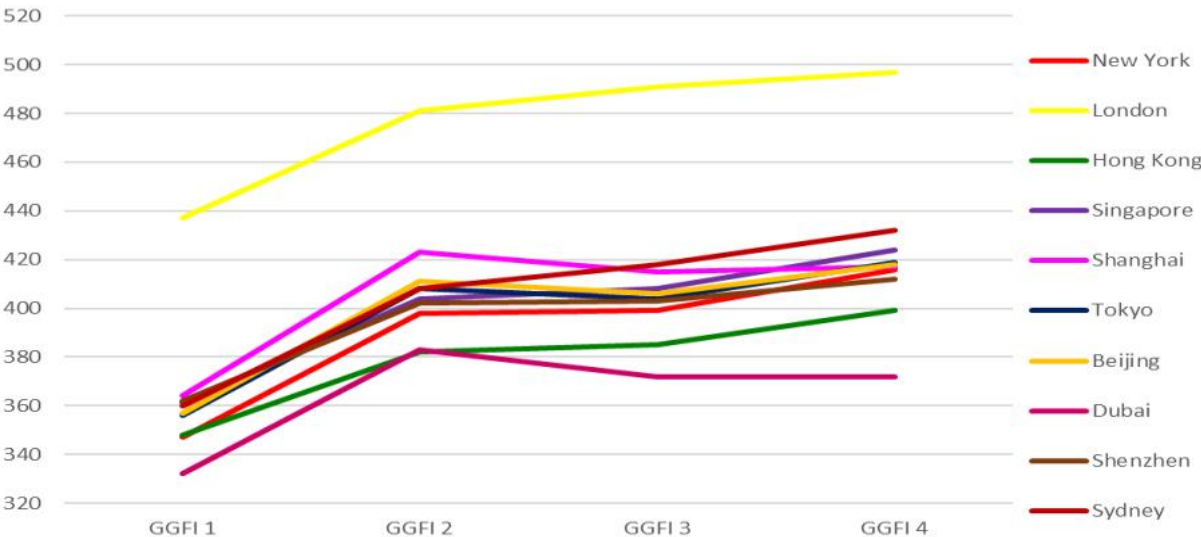
# GGFI 4 Further Analysis

**Future Prospects**

We asked respondents to identify which financial centres they thought would become more significant as green finance centres over the next two to three years. Table 4 shows the centres that were mentioned ten or more times.  Despite being identified as being likely to become more significant, the centres listed all stayed static or fell in the depth rankings in GGFI 4.  On quality, London retained its first position in the GGFI for quality and Beijing retained its 25th position.  New York, Singapore and Frankfurt rose in the rankings.  Paris fell one place, while Shanghai was down 9 in the quality rankings.

**Expected Change In Centres**

As another way of measuring future movement, we asked respondents whether the centres they rated would improve, decline, or stay the same in relation to their green finance offering over the next two to three years. This question produced a slightly different answer than the one above, and is perhaps more reliable due to a larger sample size.  The results are displayed in Chart 9 overleaf.

Forty-five out of 63 centres in the index were expected to improve or significantly improve by over half of the respondents who rated them.  Twelve centres were rated as expected to improve by 75% or more respondents: Amsterdam, Beijing, Casablanca, Copenhagen, Frankfurt, Guangzhou, Luxembourg, Paris, Shanghai, Shenzhen, Singapore, and Zürich.  Copenhagen and Montréal  led the group of centres expected to improve significantly.

**Table 4 | Centres That Will Become More Significant**

| Centre | Number of Mentions |
| --- | --- |
| Paris | 27 |
| Frankfurt | 20 |
| Shanghai | 16 |
| Singapore | 16 |
| New York | 14 |
| London | 11 |
| Beijing | 10 |

The centres with the worst outlook include Calgary, Chicago, Malta, Moscow, Prague, São Paulo, and Washington DC.  Factors which may influence this perception could include historic levels of brown financing, or political and reputational factors, all of which could have an impact on the speed of change or discourage green finance investors.
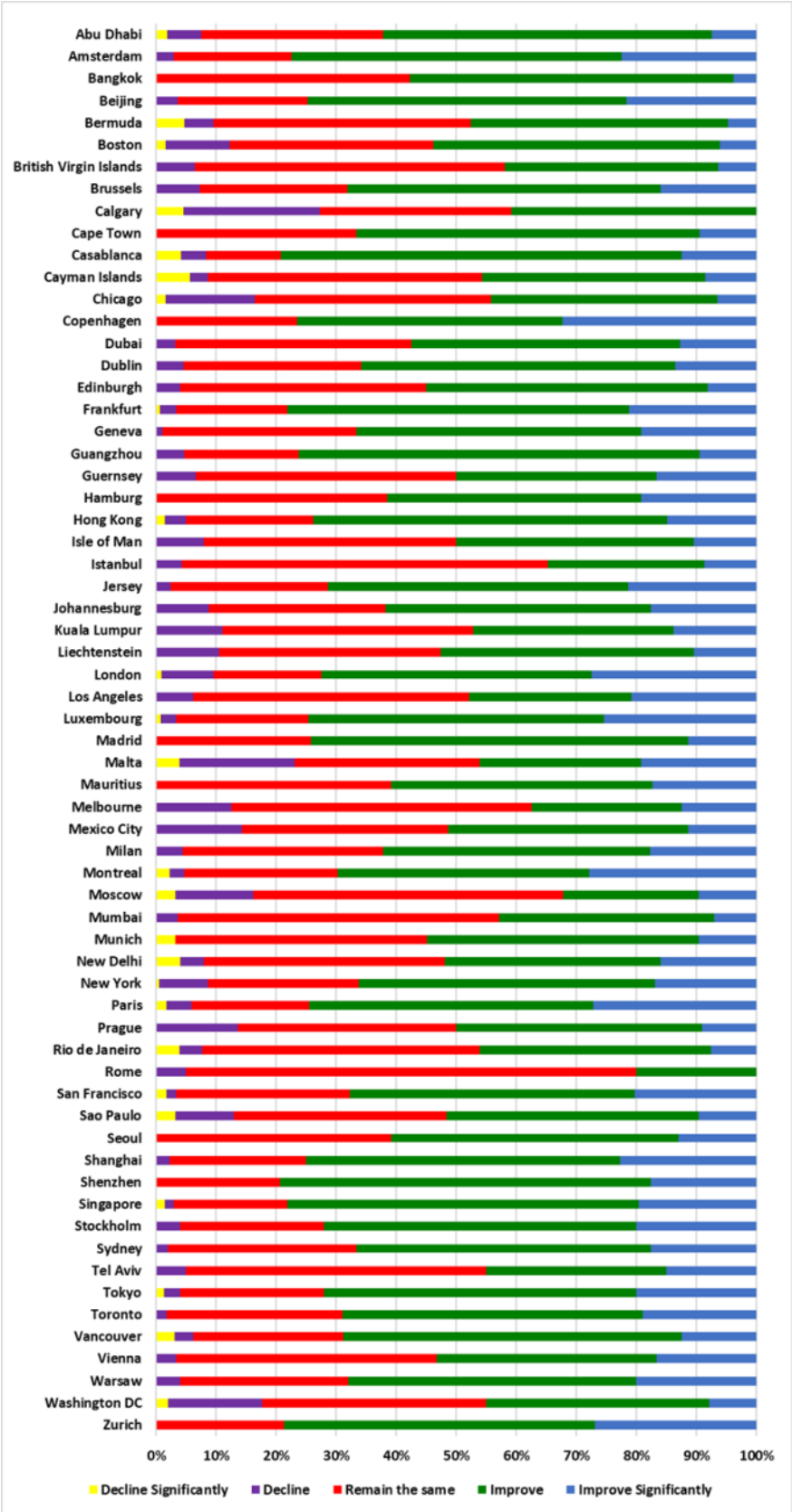
*"The right set of incentives and disincentives should be put in place to mainstream sustainable finance (supporting factor, securitisation, fiscal, risk management)."*

**Adviser, Trade Association, Luxembourg**

**Chart 9 |** **Expected Change In Green Finance Offering**

# Instrumental Factors

GGFI 4 is created using 132 instrumental factors which relate to a range of aspects of competitiveness, including sustainability measures.

Table 5 shows the top ten instrumental factors in terms of their correlation with the ranking of depth and quality.  The correlation between the GGFI and a number of well-established indices has increased over time.

Those factors with the highest correlation tend to be composite indices that reflect a city's approach to sustainability.  Such metrics describe the local environment in which financial sector workers are operating, and are also useful tools for aligning economic policies with the inclusive and green economic outcomes prioritised in the UN's Sustainable Development Goals, as the Green Economy Coalition and others have noted[1].

**Table 5 | Top Ten Instrumental Factors By R Squared Correlation**

| Depth | R Squared | Quality | R Squared |
|---|---|---|---|
| Networked Society City Index | 0.535 | Quality Of Living City Rankings | 0.563 |
| Sustainable Cities Index | 0.508 | Environmental Performance Index | 0.551 |
| World Talent Rankings | 0.486 | Sustainable Cities Index | 0.542 |
| Water Quality | 0.481 | Networked Society City Index | 0.535 |
| Quality Of Living City Rankings | 0.455 | Global Innovation Index | 0.529 |
| Environmental Performance Index | 0.433 | Corruption Perception Index | 0.524 |
| IESE Cities In Motion Index | 0.427 | Water Quality | 0.520 |
| Wage Comparison Index | 0.425 | Legatum Prosperity Index | 0.505 |
| Best Countries For Business | 0.415 | Global Intellectual Property Index | 0.503 |
| Citizens Domestic Purchasing Power | 0.415 | World Talent Rankings | 0.501 |

Focusing only on the instrumental factors which relate to sustainability, the factors most closely correlated in terms of their R Squared relationship with the GGFI rankings are set out in Table 6. Water quality ranks highly, along with a range of composite indices, which aim to measure sustainability performance across a range of social, economic and environmental factors.

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1 Green Economy Coalition, July 2019, *Principles, Priorities And Pathways For Inclusive Green Economies: Economic Transformation To Deliver The Sustainable Development Goals*  https://www.greeneconomycoalition.org/news-analysis/principles-priorities-pathways-for-inclusive-green-economies

**Table 6 | Top Ten Sustainability Instrumental Factors By R Squared Correlation**

| Depth | R Squared | Quality | R Squared |
|---|---|---|---|
| Sustainable Cities Index | 0.508 | Quality Of Living City Rankings | 0.563 |
| Water Quality | 0.481 | Environmental Performance Index | 0.551 |
| Quality Of Living City Rankings | 0.455 | Sustainable Cities Index | 0.542 |
| Environmental Performance Index | 0.433 | Water Quality | 0.520 |
| IESE Cities In Motion Index | 0.427 | IESE Cities In Motion Index | 0.488 |
| Financial Centre Corporate Sustainability Performance | 0.404 | Sustainable Economic Development | 0.449 |
| Sustainable Economic Development | 0.392 | Financial Centre Corporate Sustainability Performance | 0.439 |
| Quality Of Life Index | 0.296 | Quality Of Life Index | 0.350 |
| Global Sustainable Competitiveness Index | 0.287 | Global Sustainable Competitiveness Index | 0.303 |
| Energy Sustainability Index | 0.232 | Energy Sustainability Index | 0.302 |

The instrumental factors that have the closest correlation with the index results overall and in terms of sustainability measures are:

• the Arcadis Sustainable Cities Index: this index ranks 100 global cities on three dimensions of sustainability: people, planet, and profit.  These represent social, environmental, and economic sustainability and offer an indicative picture of the health and wealth of cities for the present and the future;

• the Mercer Quality of Living City Rankings: this index ranks cities taking account of a range of factors including political, economic, environmental, personal safety, health, education, transportation, and public service factors;

• the Yale Environmental Performance Index: this measure ranks 180 countries on 24 performance indicators across ten issue categories, covering environmental health; and ecosystem vitality.  These metrics provide a gauge at a national scale of how close countries are to established environmental policy goals;

• the OECD Water Quality Index: based on a regular survey of people's views on the water quality where they live and work;

• the IMD World Talent Rankings: based on countries' performance in three main categories — investment and development, appeal, and readiness: taking account of education, cost of living, apprenticeships, workplace training, language skills, quality of life, remuneration, and tax rates; and

• the Ericsson Networked Society City Index: this index ranks cities based on ICT maturity and their performance in sustainable urban development.

**Index Ranking For Sustainability**

We have also conducted an analysis of the assessments provided by respondents using only the instrumental factors that have a direct relationship to sustainability. This analysis produces slightly different results to the main index, as shown in the comparison in Table 7. The plus and minus figures show the difference between the main index and the index using only sustainability factors.

Where only sustainability factors are included in the analysis, this helps a centre such as Zürich, which scores higher for both depth and quality, and hinders centres such as Amsterdam, which scores lower. This reflects the relative rankings of the centres in the quantitative data for all factors and for only sustainability scores.

**Table 7 | Top 15 Centres Using All Factors And Only Sustainability Factors**

| | All Factors | | Sustainability Factors | |
|---|---|---|---|---|
| **Rank** | **Depth** | **Quality** | **Depth** | **Quality** |
| 1 | Amsterdam | London | Zürich +4 | London |
| 2 | Luxembourg | Amsterdam | Luxembourg | Zürich +3 |
| 3 | Copenhagen | Paris | London +3 | Paris |
| 4 | Stockholm | Hamburg | Copenhagen -1 | Copenhagen +2 |
| 5 | Zürich | Zürich | Amsterdam -4 | Amsterdam -3 |
| 6 | London | Copenhagen | Paris +1 | Luxembourg -4 |
| 7 | Paris | Stockholm | Stockholm -3 | Munich +2 |
| 8 | Hamburg (7=) | Luxembourg (7=) | Vancouver +2 | Hamburg -4 |
| 9 | Montréal | Munich | Toronto +4 | Stockholm -2 |
| 10 | Vancouver | Brussels | Munich +1 | Geneva +1 |
| 11 | Shanghai | Geneva | Hamburg -4 | San Francisco |
| 12 | Munich (11=) | San Francisco (11=) | Shanghai -1 | Sydney +5 |
| 13 | Casablanca | Montréal | Sydney +2 | Frankfurt +9 |
| 14 | Toronto (13=) | Vancouver | Montréal | Vancouver |
| 15 | Sydney | Edinburgh | Geneva | Toronto -1 |
| | Geneva (15=) | Melbourne (15=) | | |

# Areas Of Competitiveness

The instrumental factors used in the GGFI model are grouped into four broad areas:

• Sustainability
• Infrastructure
• Human Capital
• Business

These areas and the instrumental factor themes which comprise each area are shown in Chart 10.

**Chart 10 | GGFI Areas Of Competitiveness**
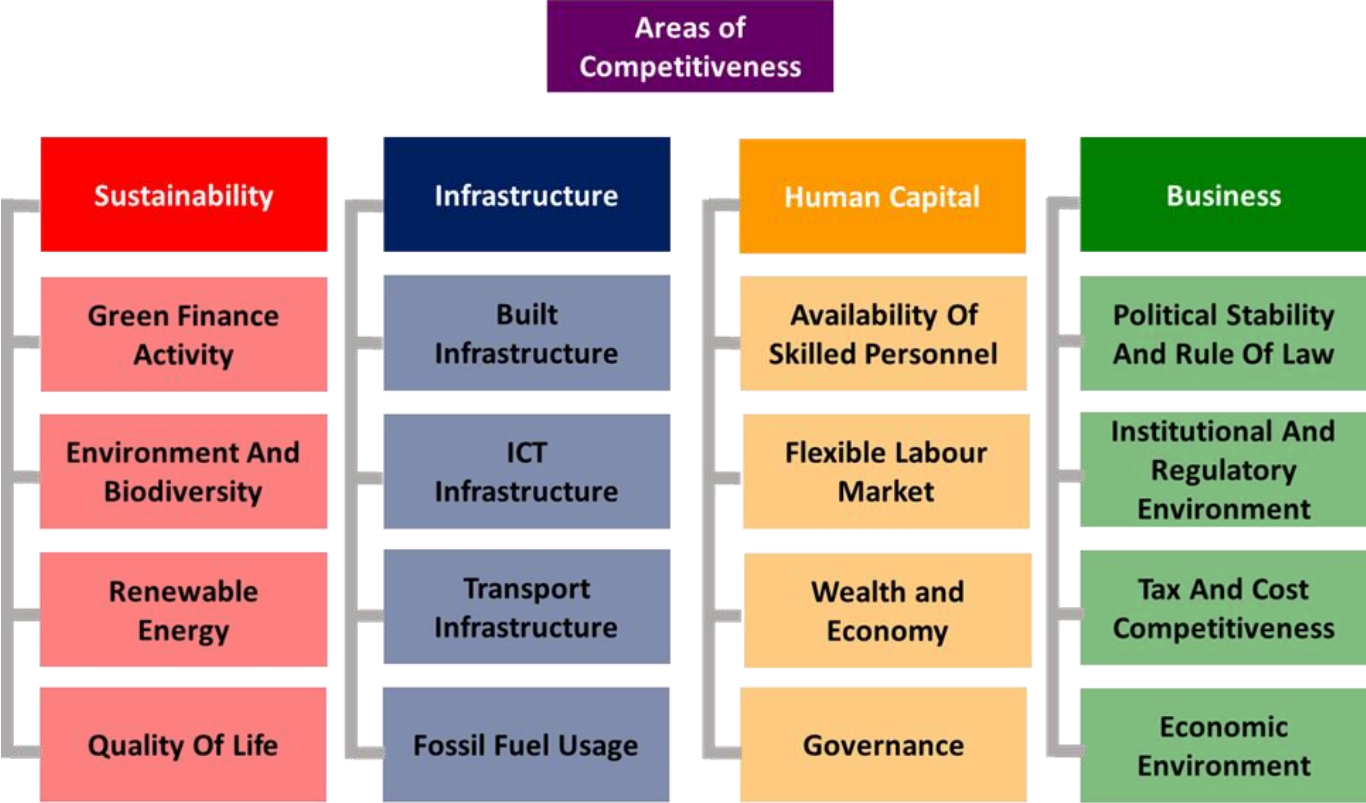


To assess how financial centres' green finance offerings perform against each of these areas, the GGFI model is run for each area separately. The top ranked 15 centres for depth and quality in each sub-index are shown in Tables 8 and 9.

These tables show that there are some centres with a focus strength, such as Tel Aviv which features in these tables only for human capital, and others with more balanced strengths, such as Paris or London, which feature in a similar rank for each measure. It is notable that London is top in each analysis for quality.

**Table 8 | Top 15 Centres For Depth By Areas Of Competitiveness**

| Rank | Sustainability | Business | Human Capital | Infrastructure |
|---|---|---|---|---|
| 1 | Zürich | Amsterdam | Luxembourg | London |
| 2 | Luxembourg | Stockholm | Stockholm | Zürich |
| 3 | London | Luxembourg | Amsterdam | Amsterdam |
| 4 | Copenhagen | Copenhagen | London | Luxembourg |
| 5 | Amsterdam | London | Copenhagen | Stockholm |
| 6 | Paris | Zürich | Zürich | Paris |
| 7 | Stockholm | Paris | Paris | Copenhagen |
| 8 | Vancouver | Sydney | Geneva | Vienna |
| 9 | Toronto | Munich | Tel Aviv | Toronto |
| 10 | Munich | Hamburg | Sydney | Munich |
| 11 | Hamburg | Toronto | Vienna | Geneva |
| 12 | Shanghai | Geneva | Toronto | Hamburg |
| 13 | Sydney | Shanghai | Montréal | Montréal |
| 14 | Montréal | Shenzhen | Shanghai | Sydney |
| 15 | Geneva | Montréal | Edinburgh | Singapore |

**Table 9 | Top 15 Centres For Quality By Areas Of Competitiveness**

| Rank | Sustainability | Business | Human Capital | Infrastructure |
|---|---|---|---|---|
| 1 | London | London | London | London |
| 2 | Zürich | Amsterdam | Amsterdam | Zürich |
| 3 | Paris | Paris | Copenhagen | Paris |
| 4 | Copenhagen | Stockholm | Zürich | Amsterdam |
| 5 | Amsterdam | Zürich | Paris | Stockholm |
| 6 | Luxembourg | Luxembourg | Stockholm | Geneva |
| 7 | Munich | Copenhagen | Luxembourg | Vienna |
| 8 | Hamburg | Munich | Geneva | Hamburg |
| 9 | Stockholm | Geneva | Edinburgh | Copenhagen |
| 10 | Geneva | Hamburg | Brussels | Luxembourg |
| 11 | San Francisco | Edinburgh | Tel Aviv | Munich |
| 12 | Sydney | Brussels | Hamburg | Toronto |
| 13 | Frankfurt | Frankfurt | Sydney | Montréal |
| 14 | Vancouver | Toronto | Melbourne | Brussels |
| 15 | Toronto | Sydney | Munich | Frankfurt |

# Commentary On Factors

The GGFI survey asks respondents to comment on factors that affect the uptake of green finance, and in particular on regulation, taxation, and the availability of skills.  These are summarised in Table 10.

**Table 10 | Commentary On Areas Of Competitiveness**

| Area Of Competitiveness | Number Of Mentions | Main Themes |
|---|---|---|
| Regulatory Environment | 243 | • Regulation must be strong and consistent<br>• Mandatory disclosure and work on taxonomies is generally supported<br>• Some countries, such as USA and China, are seen as lagging |
| Taxation | 180 | • Tax breaks and penalties are both needed<br>• Successful renewable energy subsidies should be replicating at scale<br>• A global carbon tax is seen as hard to coordinate<br>• Individual countries (e.g. Ireland) are adopting national carbon taxes |
| The Availability Of Skills In Green Finance | 220 | • Lack of due diligence and verification skills is holding back green finance<br>• University and business courses have insufficient focus on sustainability<br>   Triple-bottom-line accounting can improve knowledge levels |
| Other | | • Public finance institutions could accelerate the green finance agenda<br>• Political understanding of climate imperatives is too weak<br>• Commitment is needed to change mindsets |

Strong **regulatory intervention** was - once again - seen as "very important" in changing behaviour and strengthening the hand of investors to demand change. Ideally, regulation in different countries would move in step for competition reasons.

There were calls for mandatory disclosure of climate information (or a 'comply or explain' regime) to replace voluntary arrangements; for higher standards and better definitions and taxonomies; capital incentives; and a call for mandatory allocations to support green capital raising.

Several countries and regulators, such as the US, China or the UK's FCA, were cited as lagging behind or out of step with the climate needs of society. Some, such as the Nigerian Pension Commission, could make investment guidelines greener.

Respondents called for much greater consistency in policy around regulatory incentives and for a consistent approach to developing climate finance institutions, such as green and public investment banks. They noted that regulation is the most effective route to change even if it may be unpopular with some market participants.

**Taxation** was seen as important, with respondents calling for both tax breaks and penalties to change market prices and behaviour.  Successful measures, such as tax subsidies for renewable energy in the UK or household solar in South Africa, could be replicated on a much larger scale.

A global tax on carbon would be most effective but is hard to coordinate internationally. Nevertheless, individual countries such as Ireland are considering ambitious national carbon tax regimes.

Several respondents said that a **lack of skills** was holding back green finance, mainly due to the difficulty of finding people qualified to verify and conduct due diligence on green projects, such as measuring energy efficiency.  The lack of a suitable framework to evaluate green projects was also cited as a barrier, although knowledge levels should improve with the use of triple-bottom-line accounting in company financial statements, which takes account of ESG factors as well as profit.

Several respondents said that green finance education ought to be more widely available.  There was hope that the next generation of finance workers would have more expertise in this area but sustainability remains peripheral to many university and business courses.  There should be more initiatives such as the new Canadian Institute for Sustainable Finance at the Smith School of Business in Queen's University, Canada.

Overall, respondents felt that **government-level action** is needed.  More public and collective institutions could accelerate the green finance agenda.  Political classes have a weak understanding of the green imperatives and policy is underdeveloped.  Respondents referred to the success of the Friday for Futures children's actions and the need for commitment to change mindsets.

# Connectivity

One factor where financial centres' green finance performance differs is the extent to which centres are connected to other financial centres.

One way of measuring this connectivity is to look at the number of assessments given to and received from other centres.  Charts 11 and 12 use Hong Kong and Melbourne as examples to contrast the different levels of connectivity that the two centres enjoy.

Hong Kong has connections to a wider variety of centres, and has received more assessments from those centres than Melbourne; and has strong links in particular with London.  In relation to general competitiveness, a broader spread of connectivity appears to be an advantage.  For the GGFI, this seems to be less significant, with Melbourne outperforming Hong Kong on both depth and quality.

You can explore the connectivity data using our online tool at https://www.longfinance.net/programmes/financial-centre-futures/global-green-finance-index/ggfi4-explore-data/ggfi-4-connectivity-chart/.

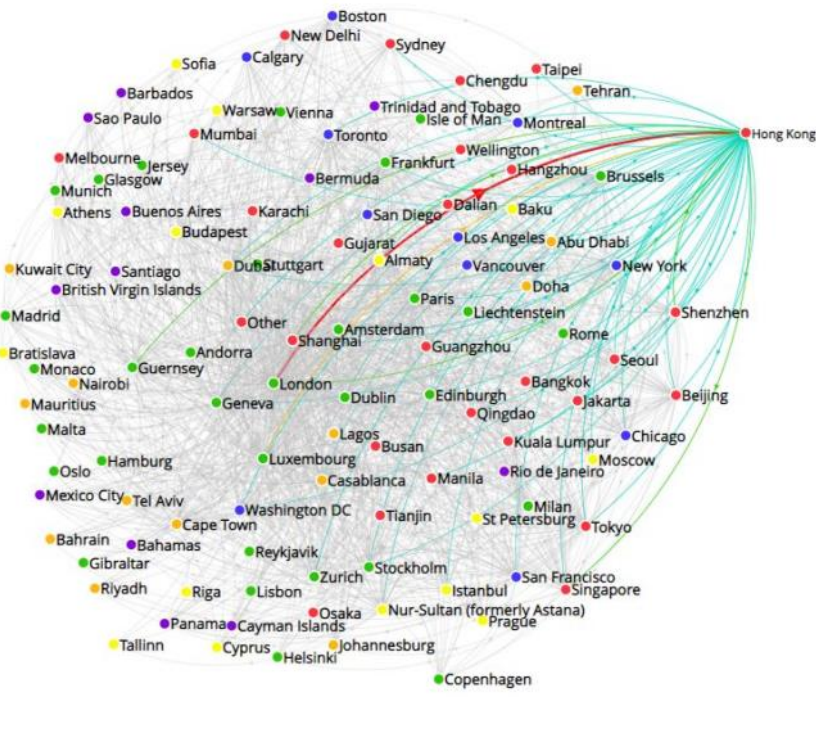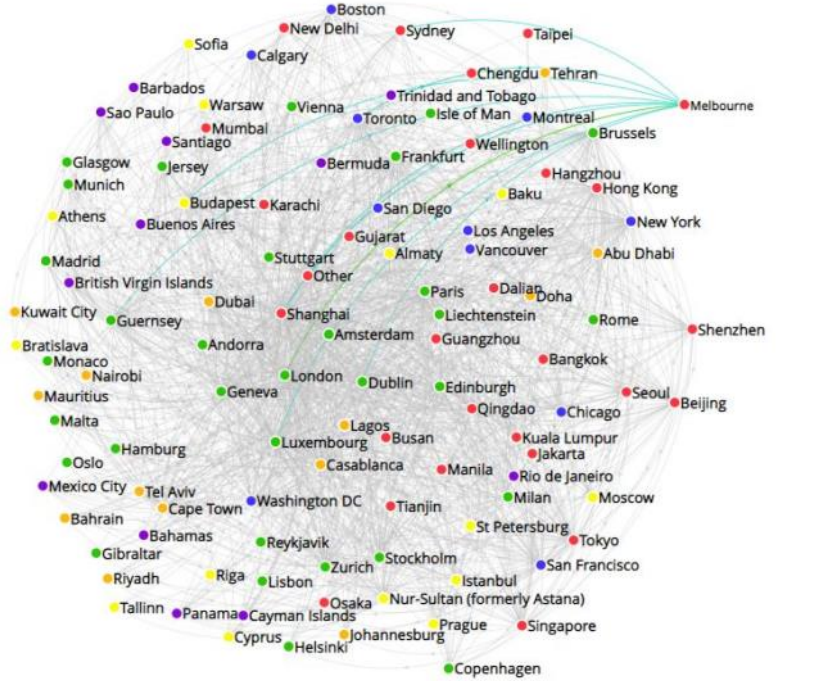**Chart 11 | GGFI 4 Connectivity - Hong Kong**



**Chart 12 | GGFI 4 Connectivity - Melbourne**

Another view of connectivity is to look at the number of assessments received by centres and the number of centres that provided assessments. Table 11 shows the relationship between these factors for the centres receiving the highest number of assessments. There is no direct correlation between the number of responses and overall performance in the index. Those receiving a high number of assessments but not ranked highly in the GGFI may need to focus on improving their underlying performance.

**Table 11 | Relationship Between Number And Spread Of Assessments For The Top 15 Centres Ranked On The Number Of Assessments Received**

| Centre | Number Of Assessments | Number Of Centres Providing Assessments |
|---|---|---|
| London | 232 | 40 |
| New York | 226 | 43 |
| Paris | 171 | 31 |
| Frankfurt | 150 | 29 |
| Hong Kong | 144 | 31 |
| Zürich | 143 | 27 |
| Singapore | 138 | 29 |
| Luxembourg | 122 | 29 |
| Amsterdam | 105 | 28 |
| Geneva | 99 | 29 |
| Dubai | 95 | 29 |
| Dublin | 90 | 20 |
| Shanghai | 88 | 31 |
| Beijing | 84 | 23 |
| Tokyo | 76 | 24 |

Assessments of the home centre of respondents are excluded from the data as there is the possibility of home centre bias. This bias can be positive or negative when compared with assessments from other centres, but on average home centre assessments are higher than assessments from other centres.

# Financial Centre Profiles

Z/Yen has conducted an analysis based on three measures (axes) that determine a financial centre's profile in relation to three different dimensions.

**'Connectivity'** – the extent to which a centre is well known among GGFI survey respondents, based on the number of 'inbound' assessment locations (the number of locations from which a particular centre receives assessments) and 'outbound' assessment locations (the number of other centres assessed by respondents from a particular centre).

**'Diversity'** – the instrumental factors used in the GGFI model give an indication of a broad range of factors that influence the richness and evenness of factors that characterise any particular financial centre. We consider this span of factors to be measurable in a similar way to that of the natural environment. We therefore use a combination of biodiversity indices (calculated on the instrumental factors) to assess a centre's diversity.
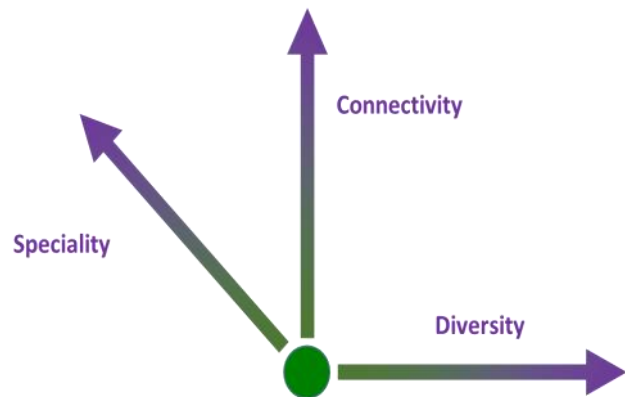
This takes taking account of the range of factors against which the centre has been assessed – the 'richness' of the centre's business environment; and the 'evenness' of the distribution of that centre's scores. A high score means that a centre is well diversified; a low diversity score reflects a less rich business environment.

**'Speciality'** – the depth within a financial centre of green finance and sustainability. A centre's 'speciality' or performance is calculated from the difference between the overall GGFI rating and the ratings when the model is calculated based only on sustainability factors.

In Tables 12 and 13, 'Diversity' (Breadth) and 'Speciality' (Depth) are combined on one axis to create a two dimensional table of financial centre profiles, first for depth and second for quality. The 64 centres in GGFI 4 are assigned a profile on the basis of a set of rules for the three measures: how well connected a centre is, how broad its services are, and how specialised it is.

The Global Leaders (in the top left of the tables) have both broad and deep green finance activity and are connected with a greater range of other financial centres. Other leading centres are profiled as Established International Centres.
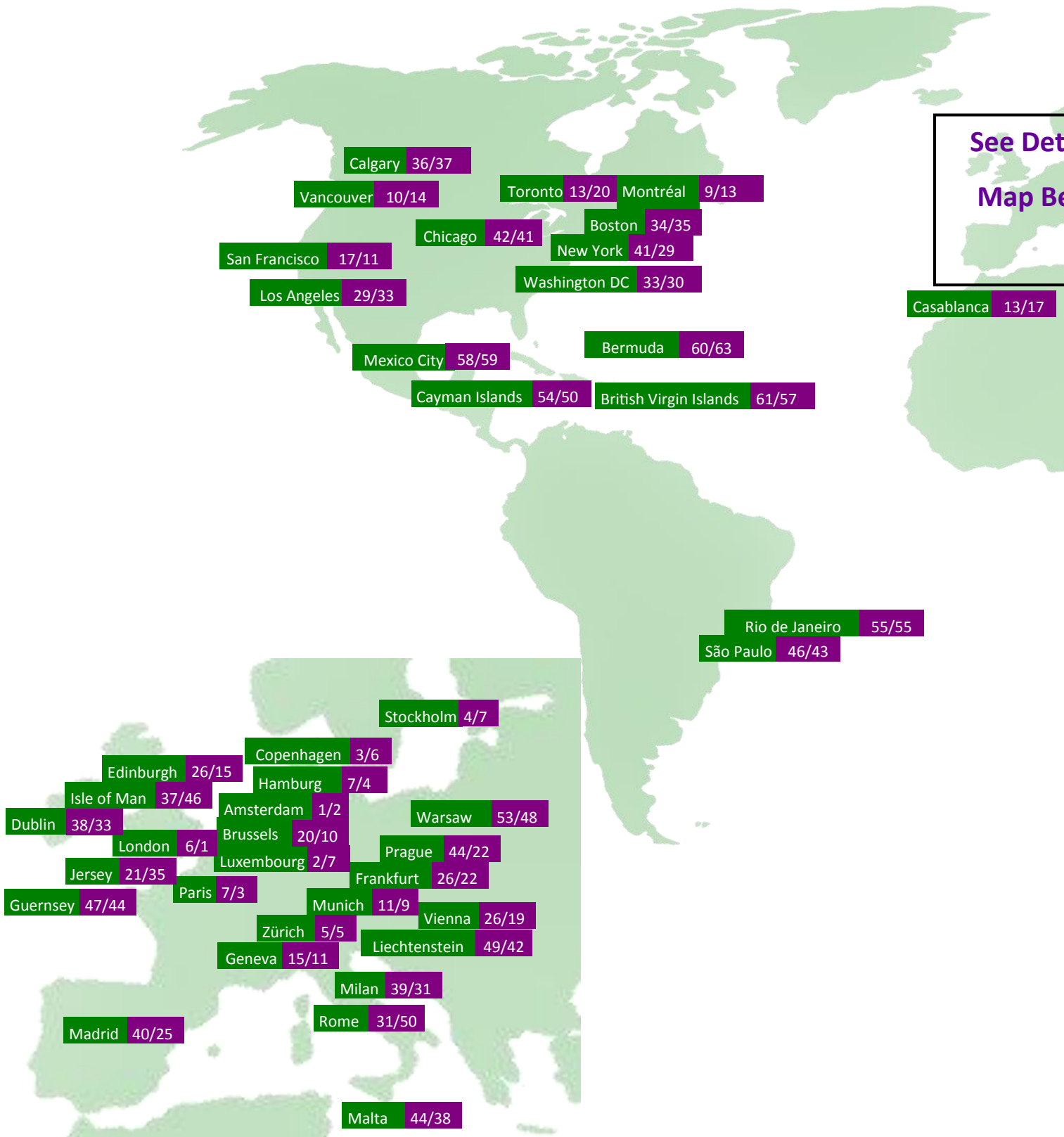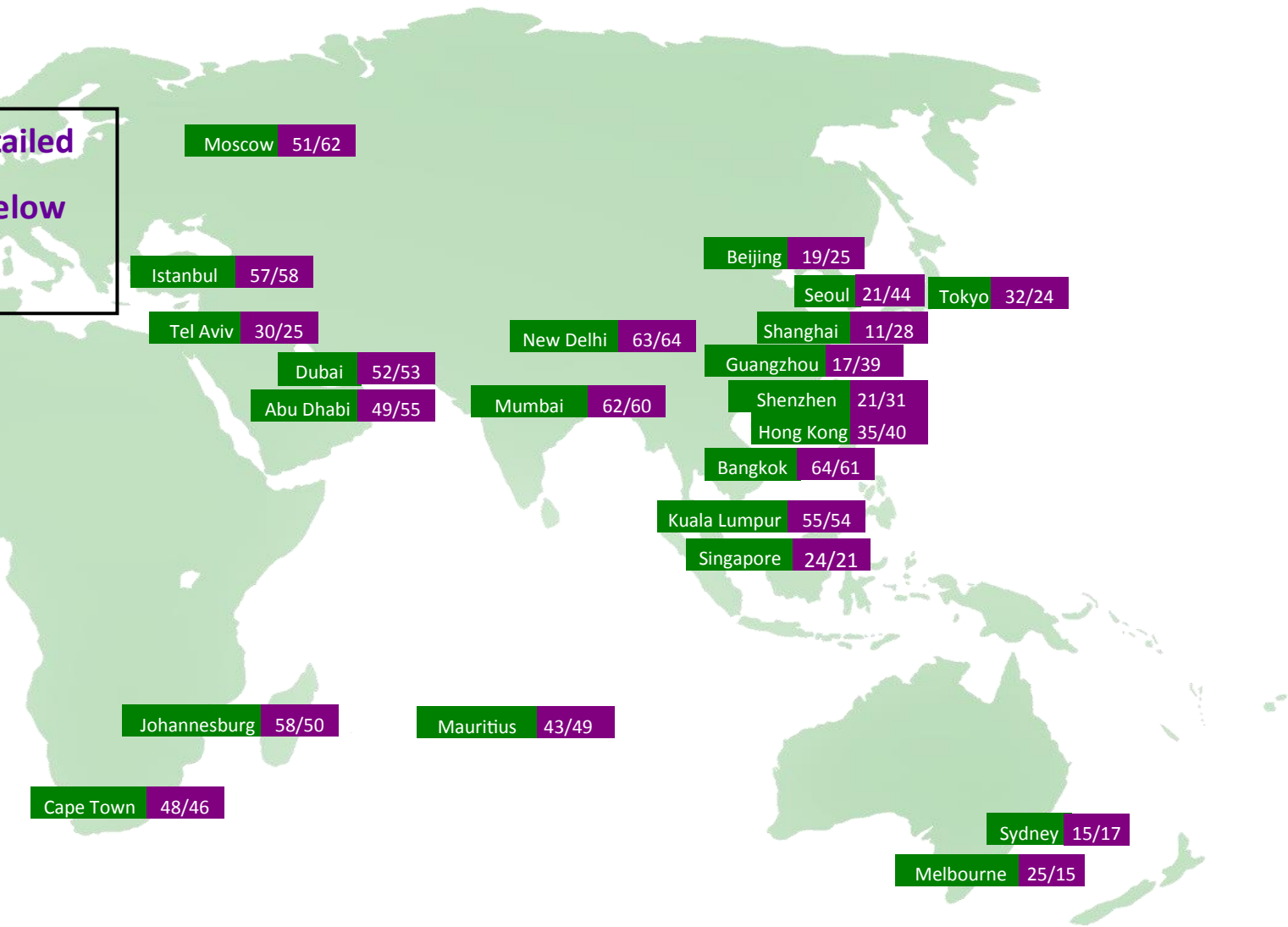
**Table 12 | Financial Centre Profiling - Depth**

| | Broad and Deep | Relatively Broad | Relatively Deep | Emerging |
|---|---|---|---|---|
| **Global** | **Global Leaders** | **Global Diversified** | **Global Specialists** | **Global Contenders** |
| | Amsterdam | Frankfurt | Luxembourg | |
| | London | | Shanghai | |
| | Paris | | Geneva | |
| | Tokyo* | | Hong Kong | |
| | New York | | Dublin* | |
| | | | Dubai | |
| **International** | **Established International** | **International Diversified** | **International Specialists** | **International Contenders** |
| | Stockholm | Chicago | Casablanca* | Cape Town |
| | Zürich | | Beijing | Rio de Janeiro* |
| | Toronto | | Shenzhen | British Virgin Islands* |
| | Sydney* | | Jersey | |
| | San Francisco* | | Singapore | |
| | Brussels | | Guernsey* | |
| | Seoul | | Liechtenstein | |
| | Edinburgh* | | Abu Dhabi | |
| | Vienna* | | Moscow* | |
| | Los Angeles | | Istanbul | |
| | Washington DC* | | Mexico City* | |
| | Boston | | | |
| | Milan | | | |
| | Madrid | | | |
| **Local** | **Established Players** | **Local Diversified** | **Local Specialists** | **Evolving Centres** |
| | Copenhagen | Warsaw | Guangzhou | Tel Aviv (New) |
| | Hamburg | | Isle of Man | Prague* |
| | Montréal | | Mauritius | Johannesburg |
| | Vancouver | | Malta | Bermuda |
| | Munich | | São Paulo | Mumbai |
| | Melbourne | | Cayman Islands* | New Delhi |
| | Rome | | Kuala Lumpur | Bangkok* |
| | Calgary* | | | |
| | **Note: An asterisk denotes centres that have changed their classification since GGFI 3** | | | |

**Table 13 | Financial Centre Profiling -  Quality**

| | Broad and Deep | Relatively Broad | Relatively Deep | Emerging |
|---|---|---|---|---|
| **Global** | **Global Leaders** | **Global Diversified** | **Global Specialists** | **Global Contenders** |
| | London | Frankfurt | Luxembourg | Shanghai* |
| | Amsterdam | Dublin* | Geneva | |
| | Paris | | Hong Kong | |
| | Tokyo* | | Dubai | |
| | New York | | | |
| **International** | **Established International** | **International Diversified** | **International Specialists** | **International Contenders** |
| | Stockholm | Zürich * | Casablanca* | Cape Town * |
| | Brussels | Sydney* | Singapore | British Virgin Islands* |
| | San Francisco | Toronto* | Beijing | Istanbul* |
| | Edinburgh* | Milan | Shenzhen | |
| | Washington DC | Los Angeles | Liechtenstein | |
| | Boston* | Chicago | Guernsey | |
| | | Seoul* | Abu Dhabi | |
| **Local** | **Established Players** | **Local Diversified** | **Local Specialists** | **Evolving Centres** |
| | Hamburg | Warsaw* | Prague | Tel Aviv (New) |
| | Copenhagen | Rome | Malta | Jersey* |
| | Munich | | Guangzhou | Johannesburg |
| | Montréal | | São Paulo* | Rio de Janeiro |
| | Vancouver* | | Isle of Man | Mexico City |
| | Melbourne* | | Mauritius | Mumbai |
| | Vienna | | Cayman Islands | Bermuda |
| | Madrid* | | Bangkok | New Delhi |
| | Calgary* | | Moscow | |
| | Kuala Lumpur* | | | |
| | **Note: An asterisk denotes centres that have changed their classification since GGFI 3** | | | |

# The GGFI 4 World - Centres In The Index

**See Det**

**Map Be**

| Centre | Score |
|--------|-------|
| Calgary | 36/37 |
| Vancouver | 10/14 |
| Toronto | 13/20 |
| Montréal | 9/13 |
| Boston | 34/35 |
| Chicago | 42/41 |
| New York | 41/29 |
| San Francisco | 17/11 |
| Washington DC | 33/30 |
| Los Angeles | 29/33 |
| Casablanca | 13/17 |
| Bermuda | 60/63 |
| Mexico City | 58/59 |
| Cayman Islands | 54/50 |
| British Virgin Islands | 61/57 |
| Rio de Janeiro | 55/55 |
| São Paulo | 46/43 |
| Stockholm | 4/7 |
| Copenhagen | 3/6 |
| Edinburgh | 26/15 |
| Hamburg | 7/4 |
| Isle of Man | 37/46 |
| Amsterdam | 1/2 |
| Warsaw | 53/48 |
| Dublin | 38/33 |
| Brussels | 20/10 |
| Prague | 44/22 |
| London | 6/1 |
| Luxembourg | 2/7 |
| Frankfurt | 26/22 |
| Jersey | 21/35 |
| Paris | 7/3 |
| Munich | 11/9 |
| Guernsey | 47/44 |
| Vienna | 26/19 |
| Zürich | 5/5 |
| Liechtenstein | 49/42 |
| Geneva | 15/11 |
| Milan | 39/31 |
| Rome | 31/50 |
| Madrid | 40/25 |
| Malta | 44/38 |

Moscow 51/62

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elow

Istanbul 57/58

Tel Aviv 30/25

Dubai 52/53

Abu Dhabi 49/55

New Delhi 63/64

Mumbai 62/60

Beijing 19/25

Seoul 21/44    Tokyo 32/24

Shanghai 11/28

Guangzhou 17/39

Shenzhen 21/31

Hong Kong 35/40

Bangkok 64/61

Kuala Lumpur 55/54

Singapore 24/21

Johannesburg 58/50

Mauritius 43/49

Cape Town 48/46

Sydney 15/17

Melbourne 25/15

The numbers beside each centre indicate the rankings first for depth and second for quality in GGFI 4.

An interactive map showing the data for each centre is at https://www.longfinance.net/programmes/financial-centre-futures/global-green-finance-index/ggfi4-explore-data/ggfi4-map/

# Burning Rembrandts: A Focus On Biodiversity



*Photo by Eutah Mi-*

Biodiversity is the net diversity of living organisms in all habitats including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems. Biodiversity forms the foundation of the vast array of ecosystem services, such as flood protection, waste decomposition and food production that support human well-being and economic systems.

Ecosystem services are complex and highly interdependent (see box 1). However, a defining and sometimes problematic feature of current economic models is the concept that some forms of natural capital can be substituted by other goods and services which perform similar functions[2], for example, livestock or fish farming replacing hunting or fishing as a source of calories. But substitution ignores the unique features and inter-dependencies of ecosystems that cannot be replaced by new plantations, even if they are 'economically' equivalent. As Michael Sandel has commented: *"Sometimes, market values crowd out nonmarket values worth caring about".*

Substitution is not without cost. With today's linear production systems (as opposed to circular) at full speed, the environment is suffering badly. In 2009, the Stockholm Resilience Centre brought together 29 leading Earth-system scientists, who identified a set of nine critical Earth-system processes with biophysical thresholds, or 'tipping points', called 'Planetary Boundaries'. Crossing these boundaries will lead to irreversible environmental change, undermining the 'safe space for human development'.

Three of the planetary boundaries have already been crossed: biosphere integrity, climate change and biogeochemical cycle (nitrogen and phosphorus cycles); and ocean acidification is entering the danger zone.

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2 Carpenter S 1997 ***Towards Refined Indicators Of Sustainable Development***, Phil & Tech 2:2 Winter 1997 Georgia Institute of Technology

**Figure 1 | Planetary Boundaries**
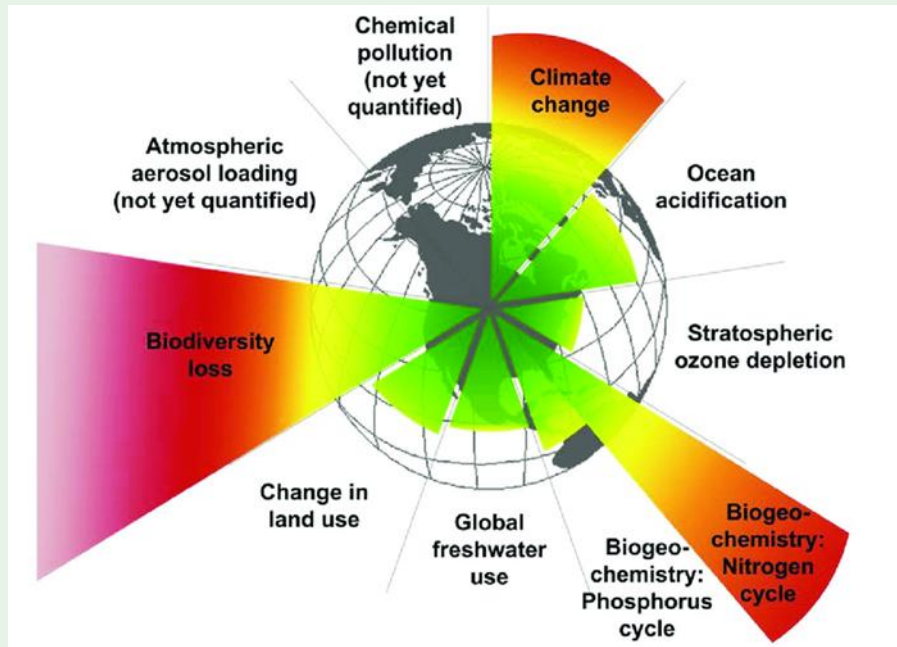


*Source: Figgis et al 2015*[3]

*Box 1: What Are Ecosystem Services?*

*The Economics of Ecosystems and Biodiversity (TEEB)\*, a global initiative focused on "making nature's values visible", defines ecosystem services as the "direct and indirect contributions of ecosystems to human well-being"*

*Ecosystem services can be categorized in four main types:*

- *Provisioning services, which include products obtained from ecosystems such as food, fresh water, materials, such as wood and fibre,  genetic resources and medicines;*
- *Regulating services, which are a by product of ecosystem processes such and include climate regulation, flood control,  waste management and pollination;*
- *Habitat services, which maintain population control (especially of pest species) and a viable gene-pool (particularly important for food crop resistance to disease);*
- *Cultural services, including mental well being, spiritual enrichment, intellectual development, recreation, inspiration and aesthetic values.*

*\*http://www.teebweb.org/about/unep-teeb-office/*

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3 Figgis P *et al* 2015  ***Valuing Nature: Protected Areas and Ecosystem Services,*** Australian Committee for IUCN Isbn: 978-0-9871654-5-9

There is a growing awareness that environmental degradation is causing biodiversity, and the ecosystems supported by it, to reach breaking point. Recent reports by the IPCC[4] and IPBES[5] leave little doubt: the combination of climate change and the depletion of biodiversity and ecosystems puts societies on the path to environmental collapse.

The last few years have seen a plethora of reports charting the havoc being wrought on the planet:

- 40% of insect species, the bedrock of eco-systems, face extinction[6].
- Huge numbers of plant species, crucial for food and pharmaceuticals, are going extinct[7].
- The UN is alarmed that plant diversity in farmers' fields is decreasing, that nearly a third of fish populations are overfished, and a third of freshwater fish species assessed are considered threatened[8].
- Driven by acidification and rocketing temperatures, marine species are going extinct even faster than those on land[9].
- Forest areas are predicted to decline by 13% by 2030, mostly in South Asia and Africa[10], although there is also concern at the rapid surge in deforestation currently occurring in Brazil[11].

The public is becoming alarmed at the scale and pace of the threats facing the planet. From an increase in vegetarian and veganism to campaigns against fast fashion and plastic packaging, both businesses and politicians are coming under increasing pressure to address environmental issues as policy priorities.

**Complacent, Indifferent Or Enabler? The Role Of Financial Systems And Services In The Destruction And Protection Of Biodiversity**

Unlike heavy industry, the most significant impacts of the financial services sector on biodiversity and natural capital are not associated with direct resource consumption or the emission of pollutants or greenhouse gases by individual financial services firms. Impacts arise from the enabling role that these organisations play in providing capital for infrastructure or activities that direct society down pathways that are unsustainable.

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4 *Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments*, Intergovernmental Panel on Climate Change (IPCC), October 2018

5 *Global Assessment of Biodiversity and Ecosystem Services*, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), May 2019

6 Sánchez-Bayoa F & Wyckhuysbcd K 2019, *Worldwide Decline Of The Entomofauna: A Review Of Its Drivers* Biological Conservation Volume 232, April 2019, Pages 8-27

7 Humphreys A, Govaerts R, Ficinski S, Lughadha E & Vorontsova M 2019 *Global Dataset Shows Geography And Life Form Predict Modern Plant Extinction And* Rediscovery Nature Ecology & Evolution, Vol 3, July 2019, 1043–1047

8 FAO, The *State of the World's Biodiversity for Food and Agriculture*, 2019, 576p.

9 Pinsky M, Eikeset A, McCauley D, Payne J & Sunday J 2019 *Greater Vulnerability To Warming Of Marine Versus Terrestrial Ectotherms* Nature, Vol 569 2 May 2019

10 OECD 2008 *Environmental Outlook to 2030*, 2008

11 https://www.theguardian.com/world/2019/jun/04/deforestation-of-brazilian-amazon-surges-to-record-high-bolsonaro

The risk of environmental collapse, resulting from natural capital depletion, can be described as a systemic risk because of the complex interdependence and interconnectedness between the elements of ecosystems; and also financially systemic, because the financial system shares similar characteristics and risks of contagion. The ability of the financial system to harm the ecosystems on which it depends raises questions about whether the financial sector has the right mix of institutions to meet environmental goals.   As Figure 2 illustrates, the quantities of finance being made available for fossil fuel and other unsustainable activities are far larger that the amounts directed to sustainable activities, and private banks and institutional investors are far more dominant than the impact investors, stakeholder banks, sovereign wealth funds and public banks that are likely to have sustainability at the core of their missions.

**Figure 2 | Finance Ignoring Nature**
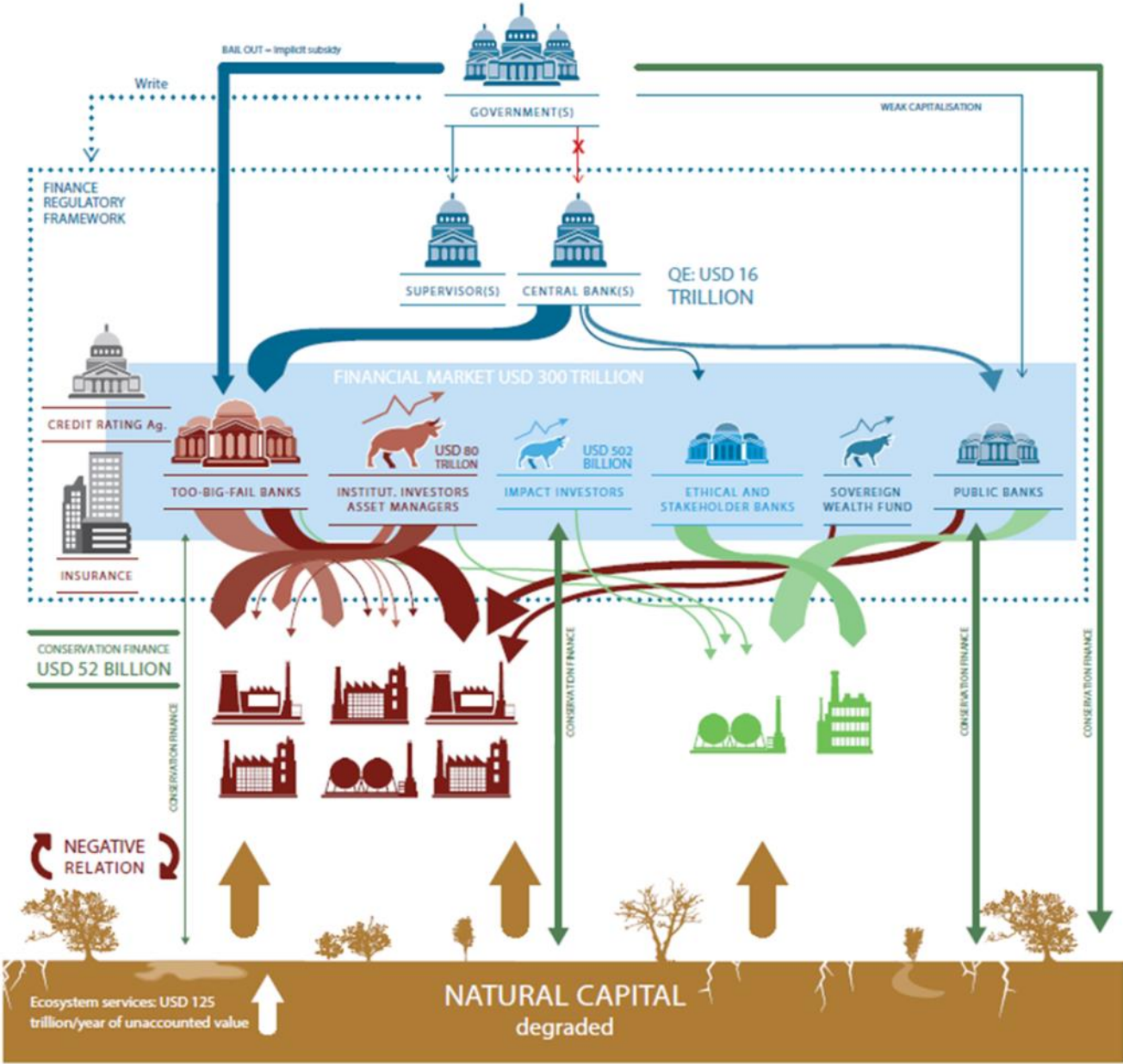


*Source: Finance Watch 2019*

The root cause of the issue is linked to short-term horizons for risk and reward, and a failure to deal effectively with externalities (see Mark Carney's speech "Breaking the tragedy of the horizon"). These challenges, as pointed out in Mainelli and Gifford's 2009 paper The Road To Long Finance: A Systems View of the Credit Scrunch[12], already pose significant risks to the global financial system, and, according to many commentators[13], have not been addressed effectively in the decade since the financial crisis occurred.

There is an urgent need to assess risks at the macro-economic level. Central banks and supervisory authorities are responsible for mapping these risks, modelling their interactions with economic and financial systems, and taking steps to mitigate them.

Private financial institutions are driven by a simple 'risk/return' ratio, and shifting capital involves changing this ratio. There is, therefore, a need, first, to enhance the financial sector's understanding of risks related to natural capital depletion and, second, to amend the return expected from activities they invest in by showing the hidden costs of economic activities and internalizing these negative externalities in the production cost. If investing in environmentally harmful activities leads to lower returns and more risk than sustainable activity, financial institutions will automatically shift their investment.

But the players in the financial system find it difficult to see, think and act long term, when structural characteristics incentivise short-term returns. As **private finance is currently ill-suited to conservation finance**, there is a need to address this issue at three levels:

- First, to address market failures at a macro-economic level by **extending time horizons and internalising externalities**. As Mainelli and Gifford (2009) state, "*Wicked problems, [problems which are difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize] cannot be solved by larger government intervention, but equally, we cannot just sit back and wait for the free market to save the day. What may be needed is bolder, yet more pointed, government intervention*".
- Second, **finance from 'mission-oriented' financial institutions must be unlocked**: that is, financial institutions which do not follow a logic only of profit, but also answer to a public interest mission (public and development banks), or to social and environmental criteria (ethical banks and impact investors).
- Finally, while attempts to create markets for ecosystem can have unintended side effects that do more harm than good, there is a role for **financial products earmarked for conservation projects**, which derive income streams from the protection and sustainable exploitation of biodiversity and ecosystems. (e.g. mutual funds, bonds, loans or equities).

12 *Mainelli* M & Gifford B 2010 *The Road to Long Finance: A Systems View of the Credit Scrunch* https://www.zyen.com/media/documents/Road_to_Long_Finance.pdf

13 IMF *2018 A Decade after the Global Financial Crisis: Are We Safer?* https://www.imf.org/en/Publications/GFSR/Issues/2018/09/25/Global-Financial-Stability-Report-October-2018

## Economic System Reliance On Ecosystems

Natural capital can be defined as the world's stocks of natural assets which include geology, soil, air, water and all living things[14].  Natural capital yields ecosystem services, such as energy (fuel), calories (food) and raw materials, as well as providing homeostatic functions such as climate regulation and flood control.  These ecosystem services are often closely interlinked, so that over-exploitation or poor stewardship in one area may have detrimental effects in another.

Managing costs and ensuring long-term value creation across supply chains requires businesses to understand better their dependencies on biodiversity and ecosystem services, and to integrate these considerations into long-term business strategies, risk-management approaches and other business activities[15].

From an investor perspective, the profitability and long-term survival of some sectors depends on well-functioning ecosystems, notably agriculture, fisheries and pharmaceuticals. The last of these sectors is



### A Lot To Lose

- Pollination services are worth approximately USD 235-577 billion to the agricultural sector

- Forestry related exports are worth in excess of USD 247 billion in global trade.

*Photo by Krzysztof Niewolny on Unsplash*

14  *World Forum On Natural Capital* https://naturalcapitalforum.com/about/
15  OECD *2019 Biodiversity: Finance and the Economic and Business Case for Action* https://www.oecd.org/environment/resources/biodiversity/G7-report-Biodiversity-Finance-and-the-Economic-and-Business-Case-for-Action.pdf

especially reliant on biodiversity, as *"nature, the master of craftsman of molecules, provides the bedrock resource for drug development, novel chemotypes and pharmacophores, and scaffolds for amplification into efficacious drugs for a multitude of diseases and other valuable bioactive agents"*[16].

Systemic failures by the financial system to value biodiversity and ecosystem services have long been recognised. In 1999, Forest Trends (a trans-national NGO), launched the Katoomba Initiative – an international working group dedicated to advancing markets and payments for ecosystem services – including watershed protection, biodiversity habitat, and carbon sequestration.

During the conference of the parties (COP) to the Convention on Biological Diversity (CBD) in Nagoya in 2010, world governments agreed to a strategic plan for biodiversity conservation, including the 20 Aichi Biodiversity Targets (ABT) to be met by 2020. Assuming that public finance would not be made available for conservation at sufficient scale, the CBD's strategic plan for 2011-2020 placed much emphasis on innovative financial mechanisms to help stimulate private investment, such as payments for ecosystem services, biodiversity offsets, markets for green products, etc.

The financing needed to implement the 20 Aichi targets (widely denounced as too modest to avert a crisis), was estimated in the range $150 to $440 billion per year. Yet even this has not been achieved.

Even with innovative market mechanisms, few conservation projects are bankable: most have low revenues, low rates of return, and relatively high transaction costs. Only around USD 50 billion of conservation finance is being raised annually[17], a sixth of the estimated global funding need. And of this, 80% comes not from financial markets but from public and philanthropic sources.

The CBD's Conference of the Parties is expected to update its strategic plan at the 15th COP in Beijing in October 2020.

**Valuing Nature**

At the heart of humankind's problematic relationship with the planet is how we value nature and natural services.

For much of human existence, nature was an elemental force to be tamed, with enclaves of civilization carved out of a threatening wilderness. Once humanity entered the Anthropocene (a theoretical geological epoch, marking indelible human impact on geology and natural systems, and defined as

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16  Veeresham C 2012 **Natural Products Derived From Plants As A Source Of Drugs** Journal Of Advanced Pharmaceutical Technology & *Research* 2012 Oct-Dec; 3(4): 200–201 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3560124/

17  Finance Watch 2019 **Making Finance Serve Nature** https://www.finance-watch.org/publication/making-finance-serve-nature-report/

starting either with widespread agriculture or the industrial revolution)  philosophers and scientists have been concerned at the damage humans were having on the natural world, and by extension, themselves.

Functioning ecosystems are essential to life on earth, yet economics and society at large either fails to place any value on natural capital or focuses on individual species without taking account of the systems of which they are part.

Placing a value on nature is fundamentally problematic.  We may be able to place a commercial value on a human kidney, and live donors can earn life-changing sums of money in some jurisdictions by selling one, but no one would be willing to sell their heart or liver.  Likewise, we may be able to place a commercial value on a tree, but what realistic price can be placed on a forest, the flood protection and pollution amelioration it provides, the as yet undiscovered medicines that are locked in its biodiversity and the mental well-being it provides.

As the political philosopher Michael J. Sandel said in his 2012 Atlantic article[18] "*Economists often assume that markets are inert, that they do not affect the goods being exchanged. But this is untrue. Markets leave their mark.*"

Just as there are difficulties in valuing nature's benefits, so there are difficulties valuing the costs to nature of environmentally harmful activities. In a study for UNPRI, Trucost estimated the global costs associated with the environmental impact of the operations of the largest 3,000 companies in the world, to be in the order of US$2.15 trillion[19].  This analysis, however, acknowledged limitations in relation to global data availability for natural resources, other than fisheries and timber, as well as for environmental impacts such as water pollution, heavy metals, land-use change and waste, particularly in non-OECD countries.  Moreover, Trucost stressed the fact that its results could be significantly higher if methodological and data obstacles could be overcome in order to account for ecosystem services degradation (e.g. climate regulation).

At present these costs are borne by society as a whole, not by industry and shareholders.  This situation is compounded by the fact that markets do not value conservation, only consumption – so an endangered rhino is worth more as an aphrodisiac or hunting trophy than as a living animal. The discounting of assets (see figure 3), which is standard accountancy practice, may be useful for investors assessing the timing of financial returns but is highly problematic for decisions about conservation and sustainability.

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18 Michael J. Sandel 2012 What Isn't For Sale?, The Atlantic https://www.theatlantic.com/magazine/archive/2012/04/what-isnt-for-sale/308902/

19  Trucost 2010 *Universal Ownership: Why Environmental Externalities Matter To Institutional Investors* https://www.unpri.org/environmental-issues/universal-ownership-why-environmental-externalities-matter-to-institutional-investors/4068.article

**Figure 3 |** Curves Representing Constant Discount Rates Of 2%, 3%, 5%, And 7%
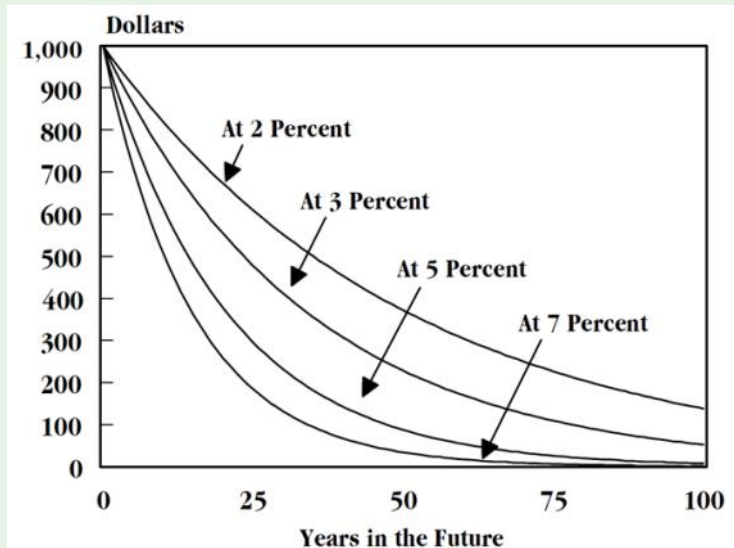


*Source: US Congressional Budget Office[20]*

As Jeffery Sachs points out[21], we are subject to the "tyranny of the present over the future", particularly when the rate of interest diminishes the incentive for the resource owner to harvest the resource at a sustainable rate and a natural asset discounts to zero over the span of a few decades, whilst a forest or a whale can take a century to reach maturity.

**Challenges To Positive Action**

Several key challenges present themselves in harnessing the power of markets to protect biodiversity:

• **Externalities And Income** – classical economic theory imbues biodiversity with some of the properties of a public good: individuals cannot (or should not) be excluded from consuming a particular commodity (for example, the flood protection qualities of upland forests), and available supply is more or less independent of the number of consumers[22]. These properties drive the "Tragedy of the Commons".

20 US Congress 2003 The Economics of Climate Change: a Primer https://www.cbo.gov/sites/default/files/108th-congress -2003-2004/reports/04-25-climatechange.pdf
21 Sachs, G 2008, *Common Wealth: Economics For A Crowded Planet*, Penguin (Allen Lane)
22 Wiesmeth H. (2012) *Public Goods in Environmental Economics. In: Environmental Economics.* Springer Texts in Business and Economics. Springer, Berlin, Heidelberg

- **Who benefits?** – many of the issues fundamental to the protection of species lie in the hands of the communities where those resources exist. Unfortunately, custom and culture are rarely a match for economic necessity, and unless there are substantial direct economic and social benefits for communities associated with the conservation of species and habitats, over-exploitation is inevitable. Deriving sustainable income streams from biodiversity, and the ecosystems and habitats which support it, is extremely challenging.

- **Metrics And Data** - the concept of biodiversity is well established, though its measurement has yet to be pinned down in the same way that carbon emissions have been established as the unit of measurement for climate change impact assessments[23]. Calculations to derive diversity and species richness were first developed by Robert MacArthur and Edward O. Wilson in 1967[24]. The results of their and subsequent formulae designed to measure natural systems, require interpretation and are ill-suited to the needs of the financial services sector. As Z/Yen highlighted in its 2011 report for the NERC, without standardised metrics, it is more difficult to measure and compare the performance of financial instruments designed to promote biodiversity and protect biodiversity and ecosystem services[25].



*Image by Evan Dennis on Unsplash*

23 Mainelli M & Harris I 2011 *The Price Of Fish* p285 Nicholas Brealey ISBN 978-1-85788-571-2

24  MacArthur R and Wilson E O 1967 *The Theory of Island Biogeography* Princeton University Press (Revised edition 26 Feb. 2001) ISBN-10: 0691088365

25 Z/Yen 2011 Finance*, Biodiversity And Managed Ecosystems: Where's The Data?* https://www.zyen.com/media/documents/nerc_biodiversity_2011.pdf

**Awareness Amongst Financial Service Professionals**

For each issue of the Global Green Finance Index, practitioners have been asked to identify the areas that they consider to be of most interest to them, and the areas they consider to have the greatest impact on sustainable development.  Despite the high potential impact of biodiversity loss on economic and financial system stability, the valuation of natural capital (and by extension biodiversity) has consistently ranked very low (see figure 4).

In part this may be a result of the issues discussed in the previous section.  However, it is also likely to be a result of the shortage of tradable financial products which have a focus on this issue.

**Figure 4 | The Views of Financial Services Professionals On Green Financial Products And Services**
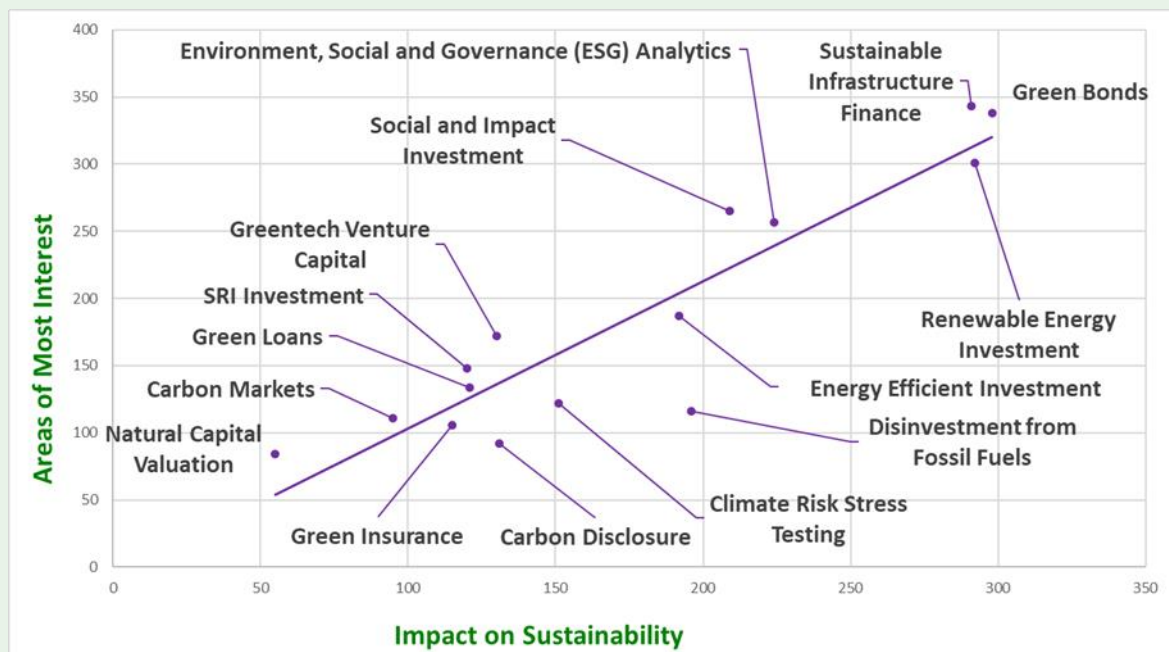


**Connecting Finance With Nature**

There is growing recognition that environmental aspects, including biodiversity and ecosystem service-related ones, have a material impact on investment risks and returns.  Driven by increasing awareness of the positive impact of sustainable business practices on long-term profitability, the business and financial services sectors have come to recognise the importance of a sustainable environment.

Initiatives such as UN Principles for Responsible Investment or UNEP Finance Initiative are illustrative of efforts to demonstrate and further explore the relationship between environmental, social and governance issues and financial performance.

Many investors active in socially responsible investment (SRI), particularly pension funds and other institutional investors, are taking a growing interest in the environmental, social and governance (ESG) aspects related to their investments, including environmental issues such as climate change, water scarcity and biodiversity.

These risks have a serious systemic dimension. The loss of biodiversity and interruption of ecosystem services is a material risk for the financial system – certainly in the long-term, even in the short-term for some investments/sectors – and needs to be included in stress tests by institutions and their supervisors. Macro-prudential instruments should be used to penalize nature-depleting investments where relevant.

Policy makers have already indicated that a regulatory response will be needed although, so far, no firm commitments have been proposed. The Network for Greening the Financial System (NGFS), a group of central bankers and financial supervisors set up to address financial system concerns linked to climate change, wrote in April 2019 that *"there are compelling reasons why the NGFS should also look at environmental risks relevant to the financial system. For instance, environmental degradation could cascade to risks for financial institutions, as reduced availability of fresh water or a lack of biodiversity could limit the operations of businesses in a specific region. These could turn into drivers of financial risks and affect financial institutions' exposures to those businesses"*[27].

This suggests that regulatory action will be forthcoming. In the meantime, the destruction of biodiversity and ecosystems is continuing to accelerate.

26  GSIA 2018 *Global Sustainable Investment Review* http://www.gsi-alliance.org/wp-content/uploads/2019/06/GSIR_Review2018F.pdf

27  NGFS, First comprehensive report, *"A call for action Climate change as a source of financial risk",* April 2019, https://www.dnb.nl/binaries/NGFS%20Call%20for%20action%20report_tcm46-383435.pdf

Four paths are essential for financial services to connect with biodiversity:

1. **Effective reporting** of the impacts of investment decisions on biodiversity in order to ensure that investors and fund managers are aware of the potential biodiversity risks associated with investment decision making.

   Non-financial reporting is mandatory in Europe (i.e. NFRD 2014), but an absence of common metrics and methodologies means quality is variable and comparison impossible; a frequent complaint among central banks and investors.  Nevertheless, some tools are already available, such as:
   - UNEP's The Economics of Ecosystems and Biodiversity (TEEB) programme[28].  TEEB is a global initiative focused on "making nature's values visible".  Its principal objective is to mainstream the values of biodiversity and ecosystem services into decision-making; and
   - InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs)[29] - a suite of models developed by Stanford University used to map and value the goods and services from nature that sustain and fulfil human life.

   What is required, as with reporting on other sustainability risks (particularly those associated with climate change), is intervention by regulators to  mandate harmonised, mandatory ESG reporting by large companies.

2. The **phasing out of environmentally-harmful subsidies** (EHS) which encourage the depletion of biodiversity and damage ecosystems, particularly with respect to forestry, agriculture and fisheries. The European Union (EU) has committed to remove or phase out EHS[30], although the EU and other nations and economic areas have a long way to go to ensure that EHS are removed.

3. The **unlocking of public finance to fund non-bankable conservation projects**, notably those with public good characteristics, long payback periods, or low risk/reward ratios, and a review of State Aid rules and other barriers to the use of national and regional development banks.

4. For projects that are bankable, **encourage the flow of private finance to protect biodiversity**.  The flow of private finance into ecosystem service and biodiversity protection must be encouraged. Over the last few decades, conservation projects which aim to protect or enhance biodiversity have primarily been funded from public and philanthropic sources.  As public finances have come under strain, conservation organisations have been under pressure to diversify their funding strategies.

One solution they have sought is "Impact Investment" - private capital invested with the specific intention of achieving a measurable or environmental impact alongside financial returns.  Impact investment designed to meet an environmental goal is sometimes referred to as conservation finance. The feat of overcoming the 'tragedy of the commons, and unlocking the value of ecosystems is made possible using a number of financial products tailored for specific purposes (see table A).

28 TEEB http://www.teebweb.org/about/unep-teeb-office/
29 InVest https://naturalcapitalproject.stanford.edu/invest/
30 IEEP 2012 *Study Supporting The Phasing Out Of Environmentally Harmful Subsidies* https://www.cbd.int/financial/fiscalenviron/eu-studyehs.pdf

## Table A | Financial Products Supporting Biodiversity

| AIM | PRODUCT | ISSUES |
|---|---|---|
| PRESERVATION | **Equity (ownership or usage rights).** This establishes conservation as an asset class, structured into investable modules. These can focus on:<br><br>• Ecosystems (such as forests which through the Programme for the Endorsement of Forest Certification (PEFC) or equivalent accreditation can be managed sustainably)<br>• Establishing and maintaining infrastructure (such as ecotourism; and<br>• Investments into additional mechanisms centred on environmental markets (such as carbon or biodiversity offsets). | This effectively transfers the ownership of public goods into private hands, and has implications with respect to indigenous communities, water and land rights.<br><br>More specifically, offsetting poses a series of problems such as lack of true substitutability because natural habitats can never be fully replaced; dependencies as conservation projects derive income from harmful activities; 'green grabbing' (land-grabbing for environmental reason)'; poor ESG track records[31]. |
| IMPROVEMENT | **Green Loans** are loans offered by banks at preferential interest rates linked to the achievement of specific environmental targets. Several large banks, particularly in the Netherlands, have pioneered the development of this type of financing vehicle, although whilst the Loan Market Association's "Green Loan Principles"[32] include biodiversity in their definitions, to date most green loans have focussed on carbon reduction. Some NGOs have also stepped into this space, for example Conservation International have founded CI Ventures as an investment fund that provides loans to small- and medium-sized enterprises that operate in the forests, oceans and grasslands where Conservation International works. | A key issue, which may have held back the issue of these instruments in connection with biodiversity, is performance measurement. |
| | **Policy Performance Bonds (PPBs)**[33] are government bonds where interest payments are linked to the delivery of an environmental policy specific target.  If a target is missed, the yield on the bond increases. In other words, policy makers will be held to their promises, and if they fail to deliver there will be a financial penalty. PPBs could be issued against a variety of different policy objectives, including biodiversity protection or enhancement. Currently no nation has been willing to issue PPBs. | PPBs may be one of the most powerful instruments that could be used in improving biodiversity, but governments have been reluctant to explore this innovation. |
| | **Green Bond** issuance in 2018 reached USD167.3bn worldwide.  The majority of these issuances focussed on infrastructure development designed to reduce carbon emissions and pollution. However, the Republic Of The Seychelles issued the world's first blue sovereign bond in October 2018.  Proceeds will be allocated to eligible activities related to sustainable fisheries and marine projects, including the expansion of marine protected areas, improved governance of priority fisheries and development of the Seychelle's blue economy. | In the absence of specific tax incentives, green bonds may differ little from mainstream bonds: issuers are often the same (especially sovereigns and large corporates), credit assessments are very similar, and the activities funded may be the same. There are also still doubts over the existence of a 'greenium' (a premium given by investor to green bonds)[34]. |

31 Green Finance Observatory 2019 *50 Shades Of Green. Part. II: The Fallacy Of Environmental Markets* https://greenfinanceobservatory.org/2019/05/23/second-policy-report-50-shades-of-green-part-ii-the-fallacy-of-environmental-*markets/*

32 LMA 2018 *Green Loan Principles* https://www.lma.eu.com/application/files/9115/4452/5458/741_LM_Green_Loan_Principles_Booklet_V8.pdf

33 Mainelli M 2019 *Policy Performance Bonds For ESG & Climate Change – A Primer* https://www.longfinance.net/news/pamphleteers/beyond-words-why-london-climate-week-needs-policy-performance-bonds/

34 Dupre S et al 2018 Shooting For The Moon In A Hot Air Balloon, 2° Investing Initiative; Ekeland I, Lefournier J 2019 L'obligation verte: homéopathie ou incantation?, Working paper, CEREMADE, Chair Energie Et Prospérité

## Table A (Continued…) | Financial Products Supporting Biodiversity

| AIM | PRODUCT | ISSUES |
|---|---|---|
| MANAGEMENT | **Quotas, Permits and Trading Schemes:** quotas and permits for fishing, logging, and water abstraction are already issued by regulators. Whilst the levels for abstraction or catches are, in the main, set in the light of scientific advice, the process is subject to lobbying and political influence. Furthermore, the holder of a licence is incentivised to exploit the resource to the maximum that a permit allows. Establishing a market to trade surpluses, would incentivise permit holders to reduce overexploitation, as water or trees in the ground, or fish in the sea would still hold a value to them. Markets in tradable permits can be effective in the management of environmental resources, as proven by carbon trading in the EU and NOX and SOX trading in the US.<br><br>Reducing Emissions from Deforestation and Degradation (REDD) is a permissible mechanism for carbon offsetting under the Kyoto Protocol. The mechanism has met with some controversy (with allegations that it has been used to fund palm oil plantations in Indonesia), but it has been used to fund conservation projects in developing nations such the Valparaiso Project in Brazil and Keo Seima Wildlife Sanctuary in Cambodia. | Markets in quotas and permits are not without controversy, and require a stable policy environment to be effective, as an over-supply of permits can damage markets and the resources they seek to protect. |

## Leadership

Biodiversity projects have been part of firms' corporate social responsibility toolkit for decades, and organisations such as HSBC have done excellent work with international conservation foundations such as IUCN and WWF[35]. However, this type of work, although extremely worthwhile, does not address the systemic threats facing global biodiversity which arise from unsustainable development patterns.

Biodiversity still has low recognition amongst financial services professionals, and although societal awareness of the threats facing ecosystems is growing, it still has only a marginal impact on the consciousness of financial service organisations.

Momentum does appear to be growing, and awareness of biodiversity issues is beginning to penetrate investment analysis, where risks arising from new legislation, breaching of quotas, fines and third-party claims, usage rights, suspension of permits or licences, refusals to grant licences, legal proceedings (particularly around transaction risks and major developments) are prompting analysts to take taking firms' biodiversity management into account in valuations and estimates of future profitability, particularly in the SRI sector.

---

35 WWF 2017 *Five Years Five River Basins: Funding Freshwater Conservation Through The HSBC Water Programme*
https://www.wwf.org.uk/sites/default/files/2017-06/170324_HWP-five-years-five-rivers.pdf

UNEPFI's Biodiversity Principles Recommendations for the Financial Sector[36], published in 2011, have been followed by some positive signs - ASN Bank from The Netherlands has put biodiversity at the heart of its corporate plans, with the target that all investments and loans of ASN Bank result in a positive effect on biodiversity in 2030[37].

Unlocking Forest Finance (UFF)[38] brings together NGOs, environmental and social sector safeguarding institutes, financial sector experts and strategic advisors including Credit Suisse, the European Investment Bank and Althelia Ecosphere in order to catalyse the creation of new financial mechanisms to stop the conversion of tropical forest for commodity production, and to support a shift towards more sustainable modes of development.

Furthermore, awareness is growing of the 'physical risks' stemming from climate change and environmental depletion. One estimate puts the financial losses from physical risks related to climate change at between $2.5 and $24.2 trillion[39].

Supervisory authorities and central banks are beginning to take a closer look to the new categories of environmental-related financial risks, which sends a strong signal to market participants.  For example, in its '2019 risk map for the banking sector', the ECB features for the first time climate risk as one of the key risks for the European banking sector.  These initiatives are still small scale and are dwarfed by the flow of finance into unsustainable activity, but indicate a shift in awareness and understanding at the margins.

As Finance Watch has argued in a recent report (see Box 2)[40], while there is much that can be done to help private finance address biodiversity loss, the scale of the problem will also require a substantial public investment plan, using a range of mission-oriented financial institutions and tools, including monetary policy, to transform systems of production and consumption as well as crowding-in more private funds.

36 UNEPFI & VfU 2011 **Biodiversity Principles – Recommendations For The Financial Sector** https://www.unepfi.org/fileadmin/documents/biodiversity_principles_en.pdf

37 https://www.asnbank.nl/over-asn-bank/duurzaamheid/biodiversiteit/biodiversity-in-2030.html

38 https://www.globalcanopy.org/what-we-do/financing-sustainable-landscapes/unlocking-forest-finance

39 Dietz S, Bowen A, Dixon C, Gradwelli P 2016 C*limate Value At Risk Of Global Financial Assets*, Nature Climate Change, Vol 6, No 7 pp676-679

40 Finance Watch 2019 *Making Finance Serve Nature* https://www.finance-watch.org/publication/making-finance-serve-nature-report/

> **Box 2: Recommendations from "Making Finance Serve Society", Finance Watch 2019**
>
> - **Broaden the scope of the Network for Greening the Financial System (NGFS) to integrate environmental risks**
> - **Create an international Taskforce for Nature-related Financial Disclosure**
> - **Support better data collection to close the data gap**
> - **Help natural capital accounting to become mainstream by carefully settling the methodology**
> - **Help natural capital accounting to become mainstream in national accounts and ensure it is used to inform policy making and economic development strategies**
> - **Request listed companies to assess and disclose their interaction with natural capital**
> - **Review the mandate, capitalisation and governance of public and development banks to expand funding towards ambitious CBD objectives**
> - **Align corporate, investor and supervisory horizons to the long term.**

## Conclusions

Awareness of biodiversity risk within the financial services sector is still at an extremely low level. Macro-economic systems, regulation, and classical economic theory continue to drive unsustainable growth patterns.

Markets can be a powerful force for good, but they require direction and parallel, complementary initiatives in the public sector.

The damage that society continues to inflict on biodiversity, and the ecosystems which support it, arise from economic activity that fails to take account of externalities. Reducing this damage will require:
- significant intervention by regulators in order to internalise costs into decision-making;
- effective metrics to measure performance;
- a combination of private and public finance; and
- a realisation that ecosystems do not exist in isolation, and that unlocking the value of nature requires that the rights and interests of indigenous populations must be harnessed in the protection of biodiversity.

# Regional Analysis

In our analysis of the GGFI data, we look at six regions of the world to explore their financial centres' green finance depth and quality.

Alongside the ranks and ratings of centres, we investigate the average assessments received by regions and centres in more detail.
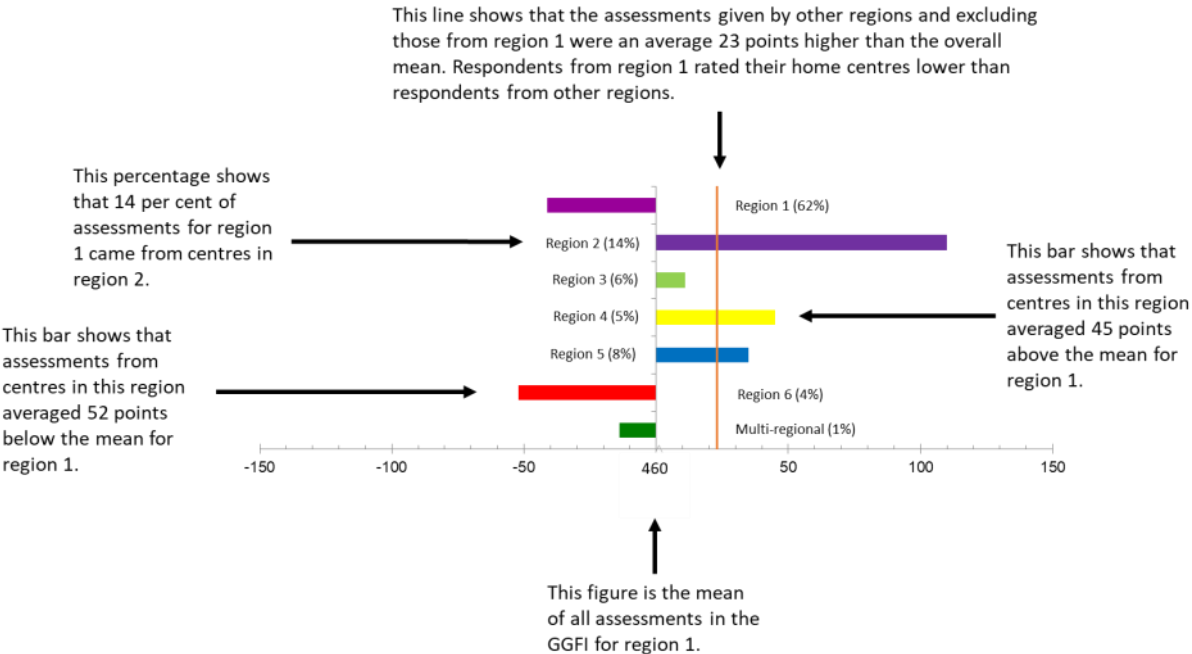
We display this analysis in charts, either for a region or an individual centre. These charts show:
- the mean assessment provided to that region or centre;
- the difference in the mean assessment when home region assessments are removed from the analysis;
- the difference between the mean and the assessments provided by other regional centres; and
- the proportion of assessments provided by each region.

Chart 13 shows an example of this analysis. Coloured bars to the left of the vertical axis indicate that respondents from that region gave lower than average assessments. Bars to the right indicate respondents from that region gave higher than average assessments. Assessments given to a centre by people based in that centre are excluded to remove 'home' bias.

The additional vertical axis (in red) shows the mean of assessments when assessments from the home region are removed. The percentage figure noted by each region indicates the percentage of the total number of assessments that are from that region.

**Chart 13 | Example: Assessments Compared With The Mean For A Region**

This line shows that the assessments given by other regions and excluding those from region 1 were an average 23 points higher than the overall mean. Respondents from region 1 rated their home centres lower than respondents from other regions.

This percentage shows that 14 per cent of assessments for region 1 came from centres in region 2.

This bar shows that assessments from centres in this region averaged 52 points below the mean for region 1.

Region 1 (62%)

Region 2 (14%)

Region 3 (6%)

Region 4 (5%)

Region 5 (8%)

Region 6 (4%)

Multi-regional (1%)

This bar shows that assessments from centres in this region averaged 45 points above the mean for region 1.

-150    -100    -50    460    50    100    150

This figure is the mean of all assessments in the GGFI for region 1.

# North America

• Ten North American centres feature in the GGFI, with Canadian centres continuing to outperform US centres. Canada has three centres in the top 20 overall in GGFI 4.

• Calgary and San Francisco are outliers in terms of country performance. This may reflect San Francisco's early adoption of disinvestment and Calgary's legacy of brown finance.

• Montréal is top in the region for depth, while San Francisco takes top position for quality.

• People from Western Europe, North America, and Latin America & The Caribbean gave North American centres a lower than average rating. Respondents from other regions gave North American centres a higher than average rating.

**Table 14 | North America Centres In GGFI 4**

| Centre | Depth | | Centre | Quality | |
|---|---|---|---|---|---|
| | GGFI 4 | | | GGFI 4 | |
| | Rank | Rating | | Rank | Rating |
| Montréal | 9 | 437 | San Francisco | 11= | 443 |
| Vancouver | 10 | 424 | Montréal | 13 | 438 |
| Toronto | 13= | 420 | Vancouver | 14 | 435 |
| San Francisco | 17= | 416 | Toronto | 20 | 426 |
| Los Angeles | 29 | 405 | New York | 29 | 416 |
| Washington DC | 33 | 397 | Washington DC | 30 | 415 |
| Boston | 34 | 393 | Los Angeles | 33= | 408 |
| Calgary | 36 | 391 | Boston | 35= | 406 |
| New York | 41 | 381 | Calgary | 37 | 404 |
| Chicago | 42 | 379 | Chicago | 41 | 393 |

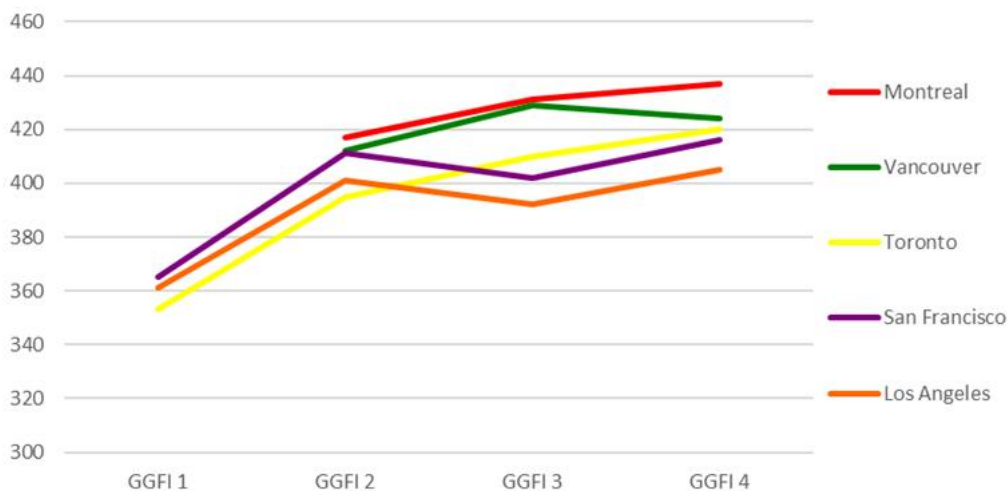**Chart 14 | Top Five North American Centres Ratings Over Time - Depth**

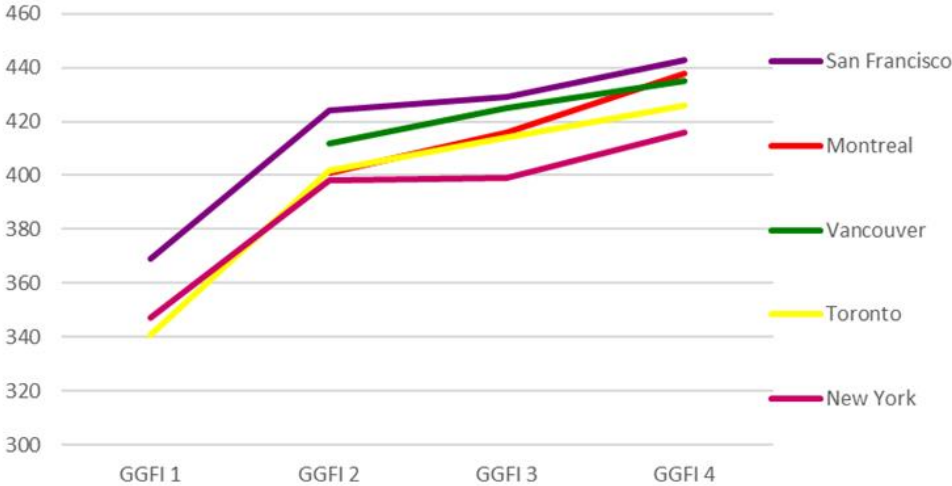**Chart 15 | Top Five North American Centres Ratings Over Time - Quality**



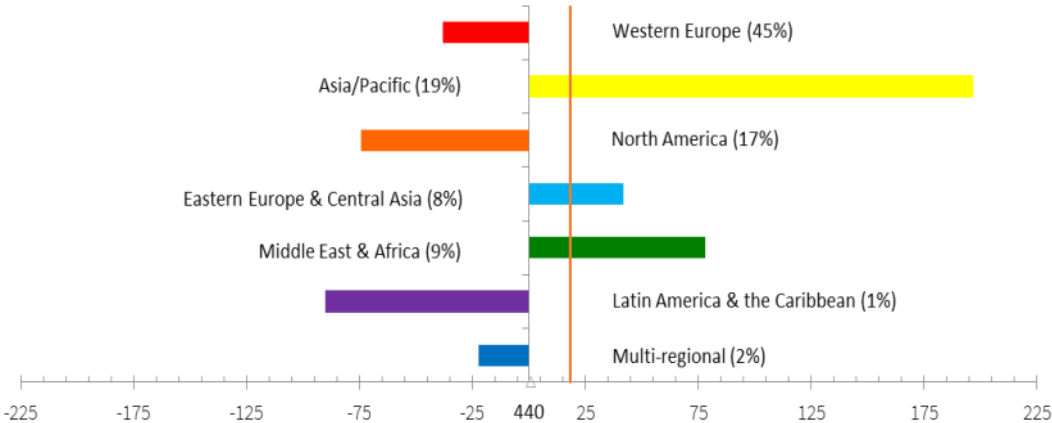**Chart 16 | North American Regional Assessments For Depth – Difference From The Mean**



**Chart 17 | North American Regional Assessments For Quality – Difference From The Mean**
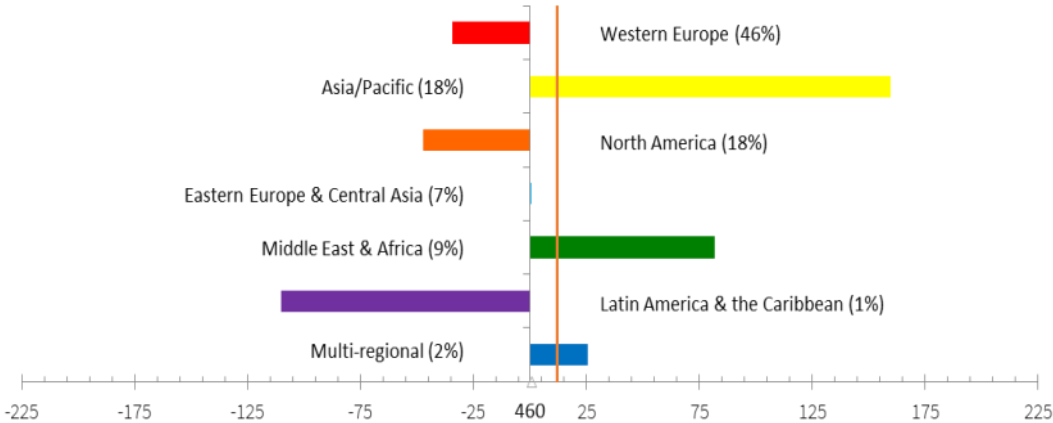
**Chart 18 |** **Regional Assessments For Depth For Montréal – Difference From The Mean**
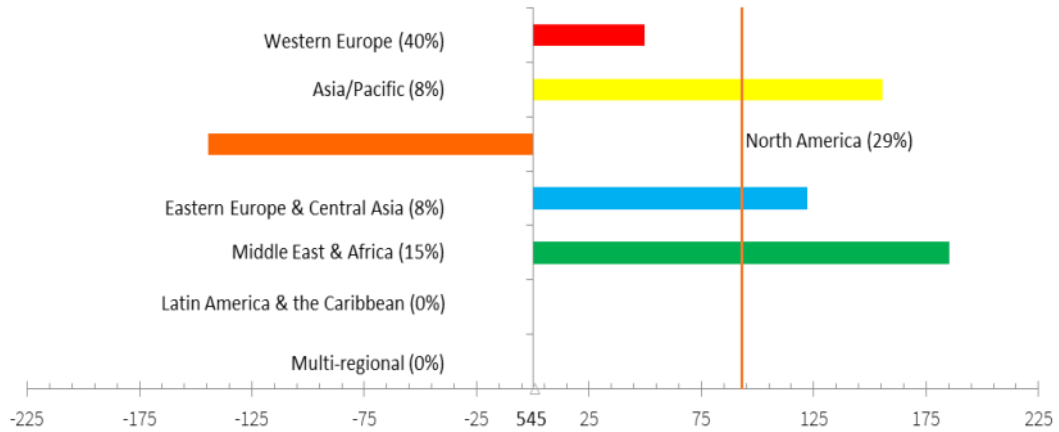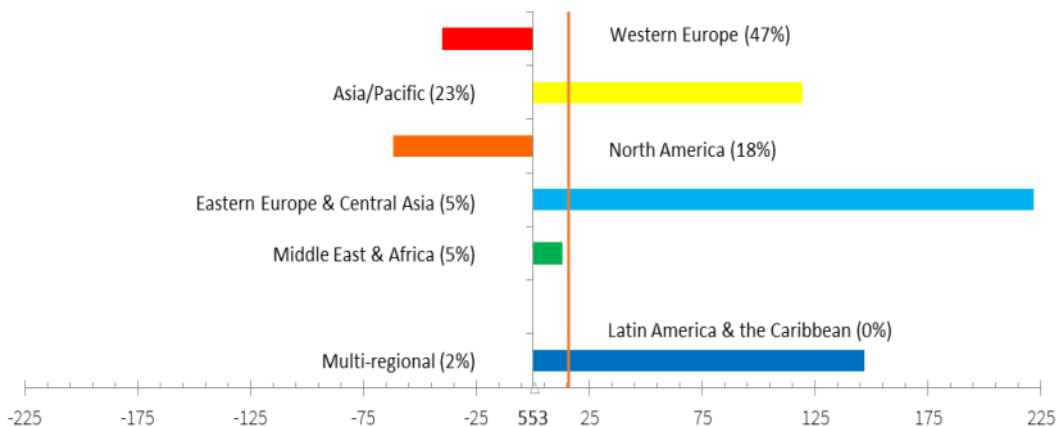


**Chart 19 |** **Regional Assessments For Quality For San Francisco – Difference From The Mean**



*"The challenge is to invest in green finance capabilities when public market enablers, like green banks and incentives, aren't moving in predictable directions."*

**Investment Banker, Toronto**

# Middle East & Africa

- Casablanca retained its position as the leading centre in the Middle East & Africa.  It stayed at 13th place in the depth rankings and fell 2 places to 17th in the quality rankings after gaining 13 places in GGFI 3.
- New entrant to the index, Tel Aviv, placed second in the region.
- Cape Town, Johannesburg, and Dubai fell in both the depth and quality ranking.
- Respondents from Asia/Pacific, Eastern Europe & Central Asia, and the Middle East & Africa scored cities in the region higher than the average, with other regions rating cities in the region lower than average.

**Table 15| Middle Eastern & African Centres In GGFI 4**

| Centre | Depth GGFI 4 | | Centre | Quality GGFI 4 | |
| --- | --- | --- | --- | --- | --- |
| | Rank | Rating | | Rank | Rating |
| Casablanca | 13= | 420 | Casablanca | 17= | 432 |
| Tel Aviv | 30 | 401 | Tel Aviv | 25= | 418 |
| Mauritius | 43 | 376 | Cape Town | 46 | 387 |
| Cape Town | 48 | 367 | Mauritius | 49 | 379 |
| Abu Dhabi | 49 | 362 | Johannesburg | 50= | 378 |
| Dubai | 52 | 360 | Dubai | 53 | 372 |
| Johannesburg | 58= | 349 | Abu Dhabi | 55= | 358 |

**Chart 20 | Top Five Middle East & African Centres Ratings Over Time—Depth**
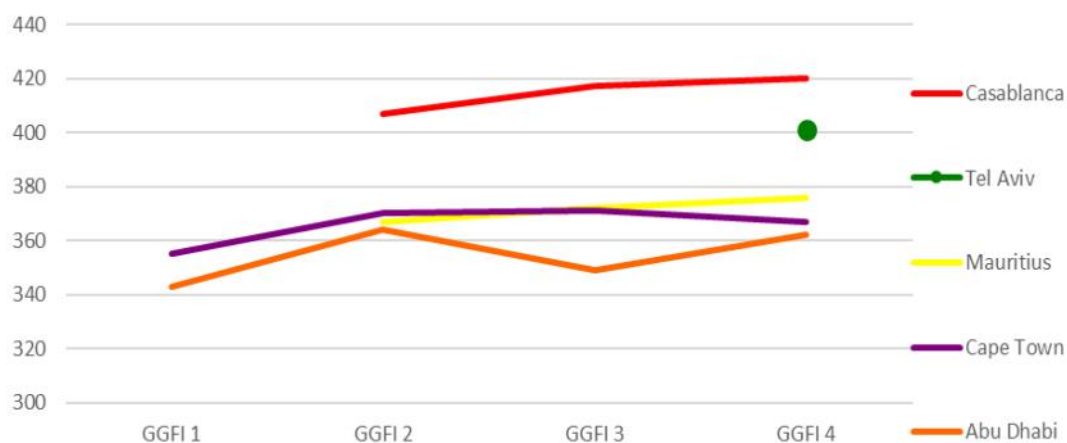
**Chart 21 | Top Five Middle East & African Centres Ratings Over Time - Quality**
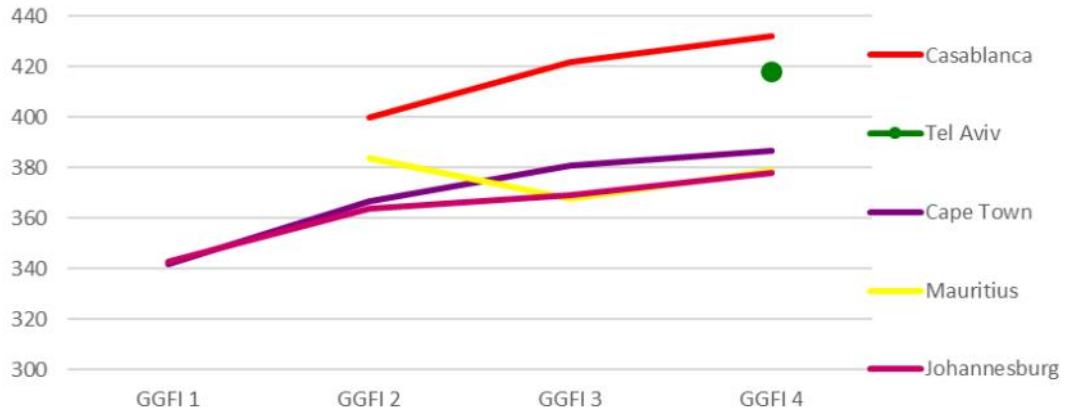


**Chart 22 | Middle East & Africa Regional Assessments For Depth – Difference From The Mean**
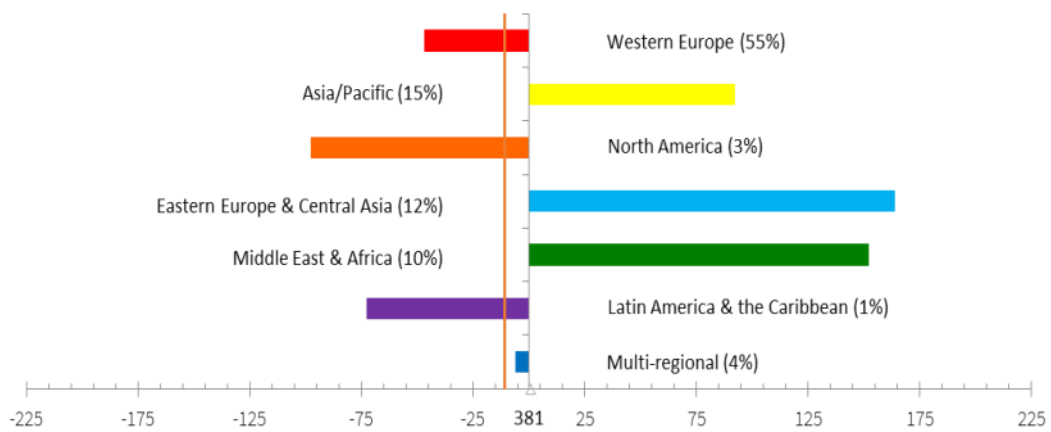


**Chart 23 | Middle East & Africa Regional Assessments For Quality – Difference From The Mean**

**Chart 24 | Regional Assessments For Depth For Casablanca – Difference From The Mean**



**Chart 25 | Regional Assessments For Quality For Casablanca – Difference From The Mean**
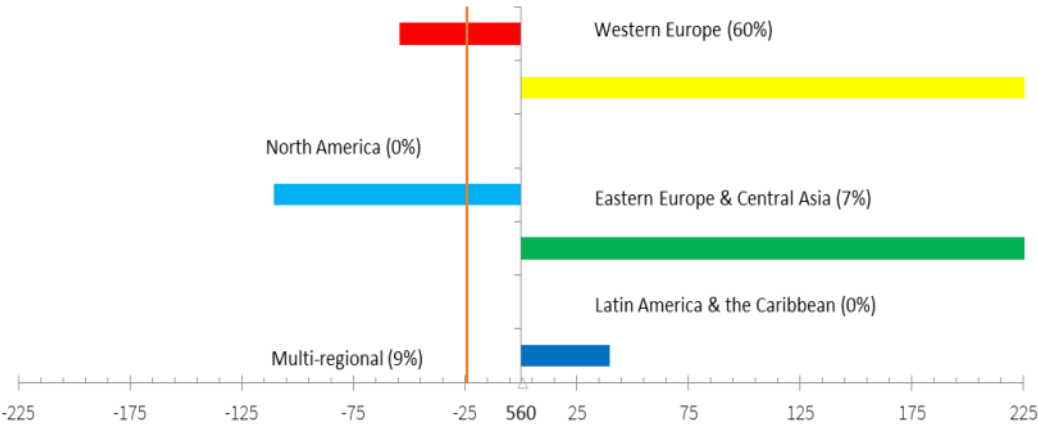


*"In South Africa, we require greater transition to green and sustainability from Government in terms of energy plans. Not much regulatory pressure in banking yet, more in asset management."*

**Senior Banker, Johannesburg**

# Eastern Europe & Central Asia

- Prague remained as the leading centre for depth and quality in the region; but lost a ranking place for depth.
- Moscow rose five places for depth and it is interesting to note that the first green bond in Russia was issued recently for the electrification of passenger trains.
- Warsaw fell on both depth and quality.
- Ratings given by Western European and North American respondents were below the average for the region and ratings for quality given by Eastern European & Central Asian respondents were also below average.

**Table 16 |** **Eastern European & Central Asian Centres In GGFI 4**

| Centre | Depth GGFI 4 | | Centre | Quality GGFI 4 | |
|---|---|---|---|---|---|
| | **Rank** | **Rating** | | **Rank** | **Rating** |
| Prague | 44= | 375 | Prague | 22= | 420 |
| Moscow | 51 | 361 | Warsaw | 48 | 386 |
| Warsaw | 53 | 359 | Istanbul | 58 | 354 |
| Istanbul | 57 | 350 | Moscow | 62 | 346 |

**Chart 26 |** **Eastern European & Central Asian Centres Ratings Over Time—Depth**
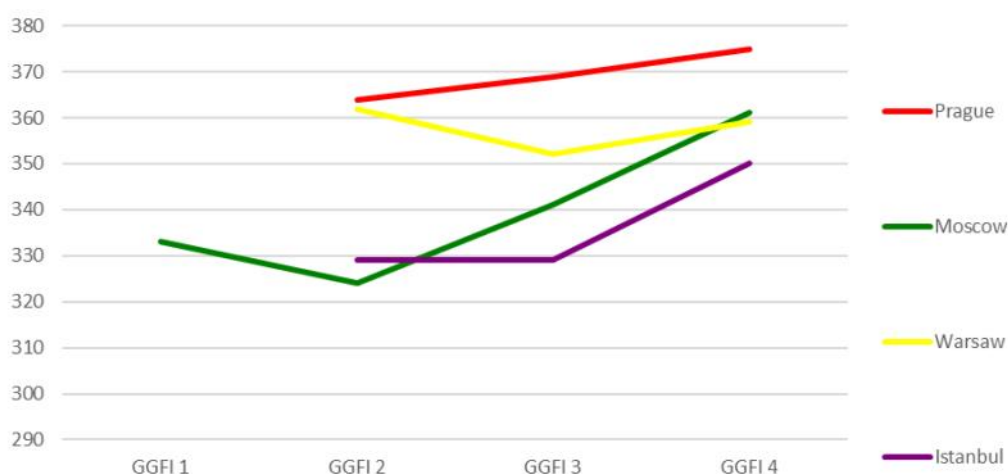
**Chart 27 | Eastern European & Central Asian Centres Ratings Over Time—Quality**
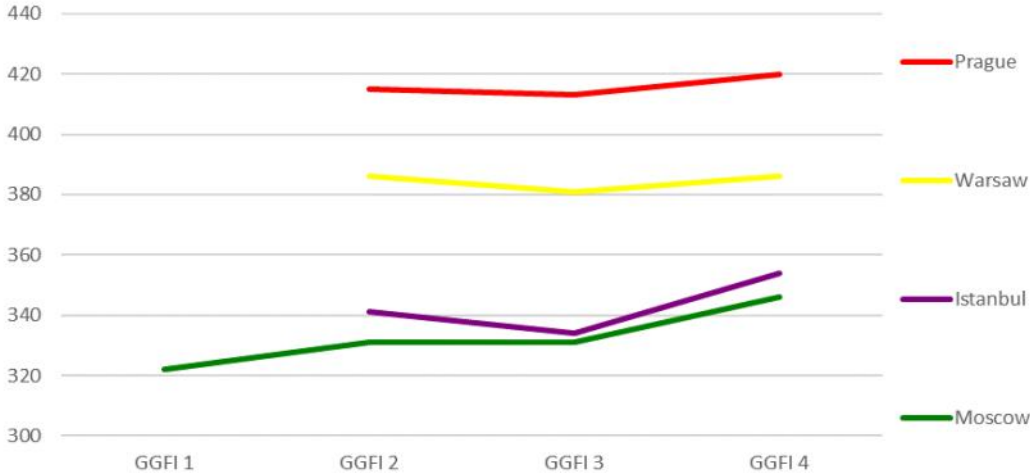


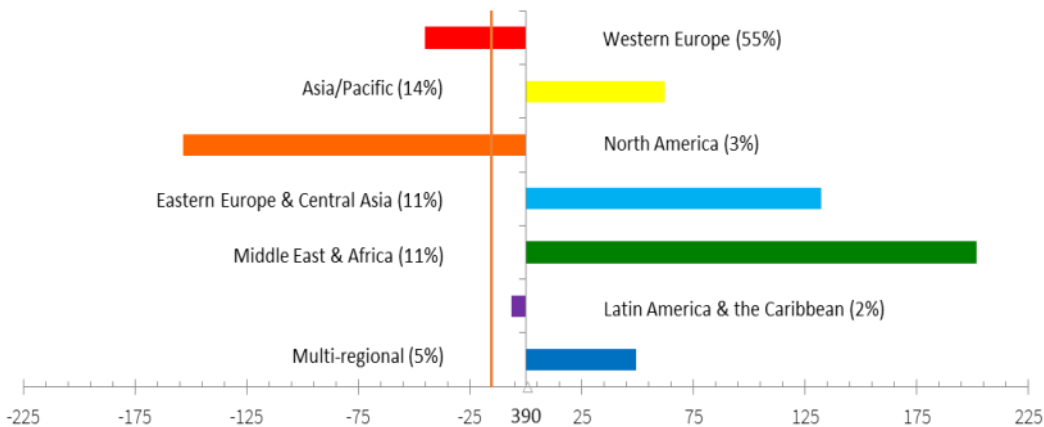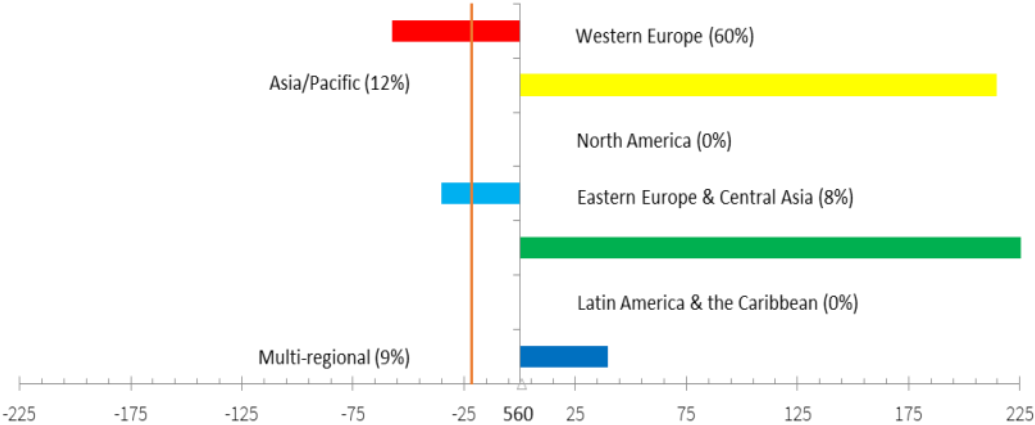**Chart 28 | Eastern European & Central Asian Regional Assessments For Depth – Difference From The Mean**



**Chart 29 | Eastern European & Central Asian Regional Assessments For Quality – Difference From The Mean**

**Chart 30 | Regional Assessments For Prague For Depth – Difference From The Mean**



**Chart 31 | Regional Assessments For Prague For Quality – Difference From The Mean**
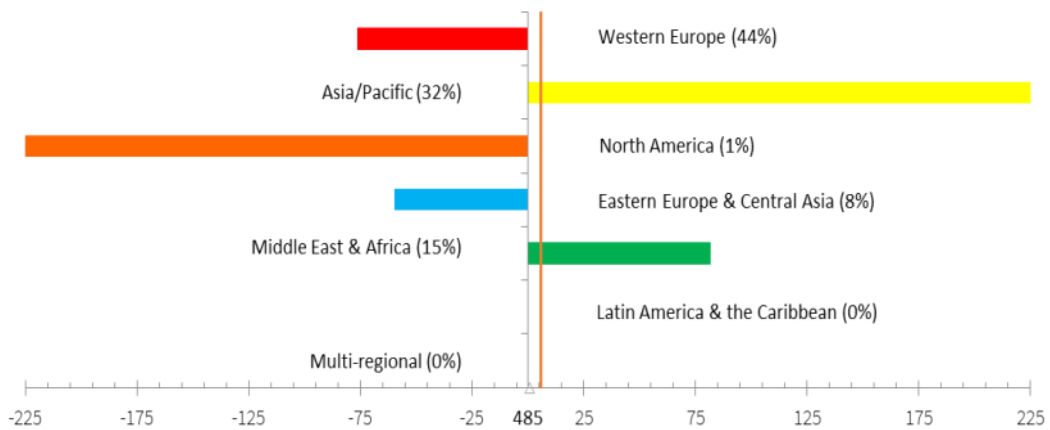


*"An open immigration system is important. Expertise is not widespread."*

**Senior Insurer, London**

# Western Europe

- Western European centres continue to perform well, with eight of the top ten ranked centres for depth and all ten for quality.
- Amsterdam retained its leading place in the depth index, and moved to second place in the quality index, overtaking Paris.  Luxembourg improved for both depth and quality, rising to second place for depth.
- In the quality index, London remains at the top of the table, although its improvement in ratings was slower than the main challengers.  On current trends, London would be overtaken by Amsterdam, Paris, Hamburg, and Zürich  by the publication of GGFI 6 in 12 months time.
- The leading German centres, Hamburg and Munich, improved their position for depth, with Munich up nine places.
- Assessments from Western Europe and North America were below average for both depth and quality, while assessments from Latin America & The Caribbean were below the average for depth. Assessments from other regions were above the mean.

**Table 17 | Western European Top 10 Centres In GGFI 4**

| Centre | Depth GGFI 4 | | Centre | Quality GGFI 4 | |
|---|---|---|---|---|---|
| | Rank | Rating | | Rank | Rating |
| Amsterdam | 1 | 471 | London | 1 | 497 |
| Luxembourg | 2 | 459 | Amsterdam | 2 | 479 |
| Copenhagen | 3 | 455 | Paris | 3 | 477 |
| Stockholm | 4 | 453 | Hamburg | 4 | 476 |
| Zürich | 5 | 452 | Zürich | 5 | 473 |
| London | 6 | 447 | Copenhagen | 6 | 466 |
| Paris | 7= | 440 | Stockholm | 7= | 465 |
| Hamburg | 7= | 440 | Luxembourg | 7= | 465 |
| Munich | 11= | 422 | Munich | 9 | 458 |
| Geneva | 15= | 419 | Brussels | 10 | 444 |

*"The Bank of England/Prudential Regulation Authority are thought leaders in aspects of this field yet the number of UK green bonds is pitiful.*
*The questions are why and how to change this?"*

**Senior Risk Adviser, London**

**Chart 32 | Top Five Western European Centres Ratings Over Time—Depth**
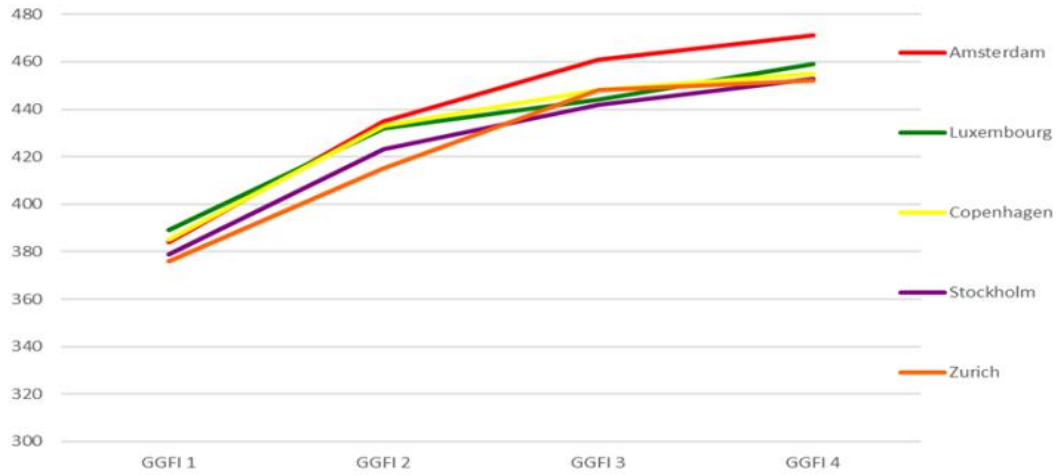


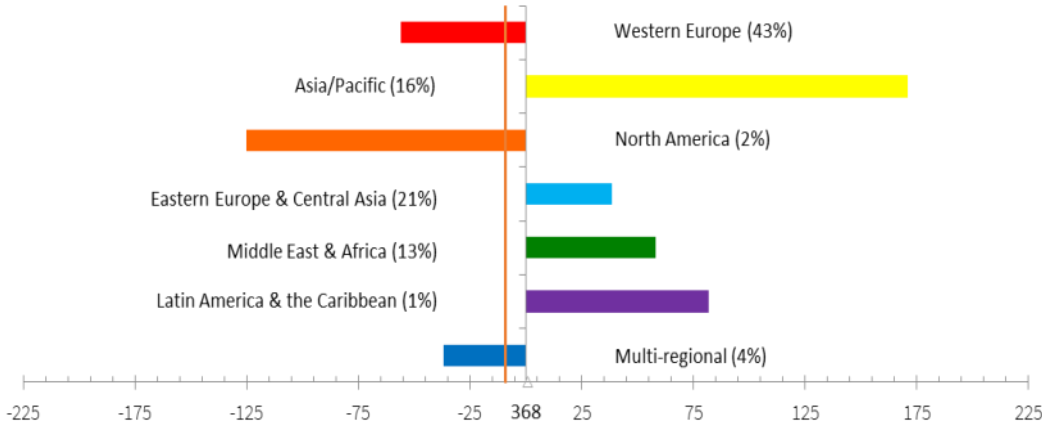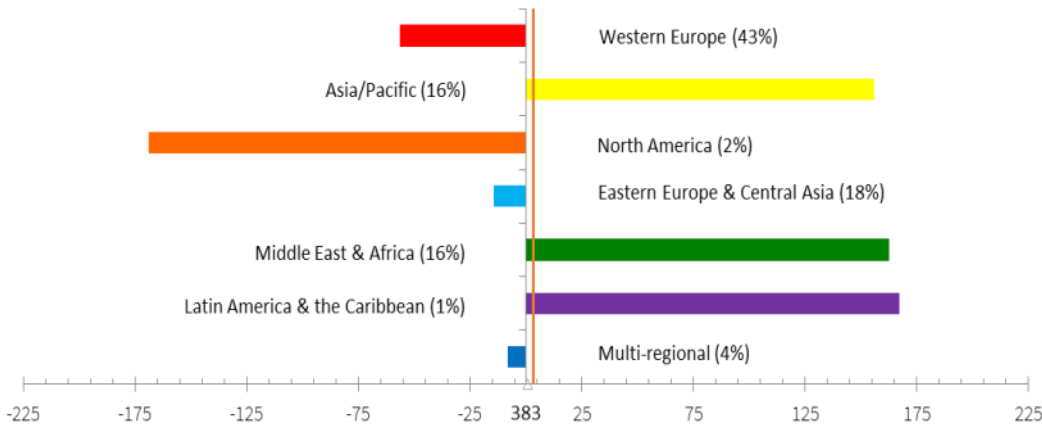**Chart 33 | Top Five Western European Centres Ratings Over Time—Depth**
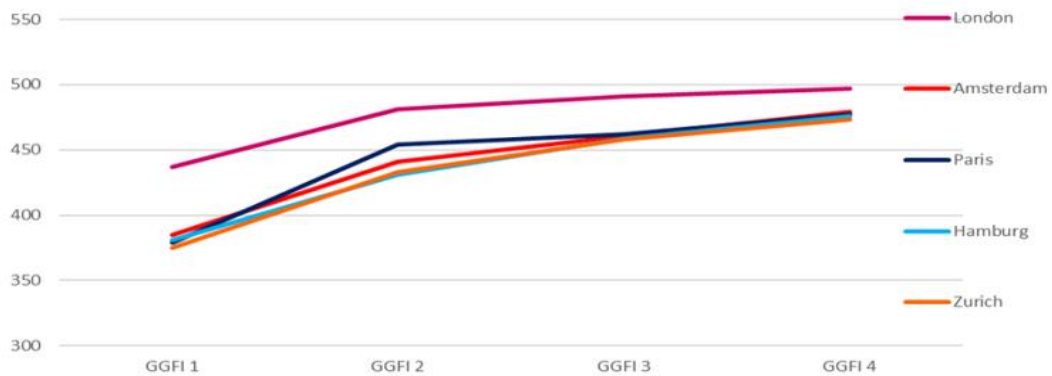


**Chart 34 | Western Europe Regional Assessments For Depth – Difference From The Mean**
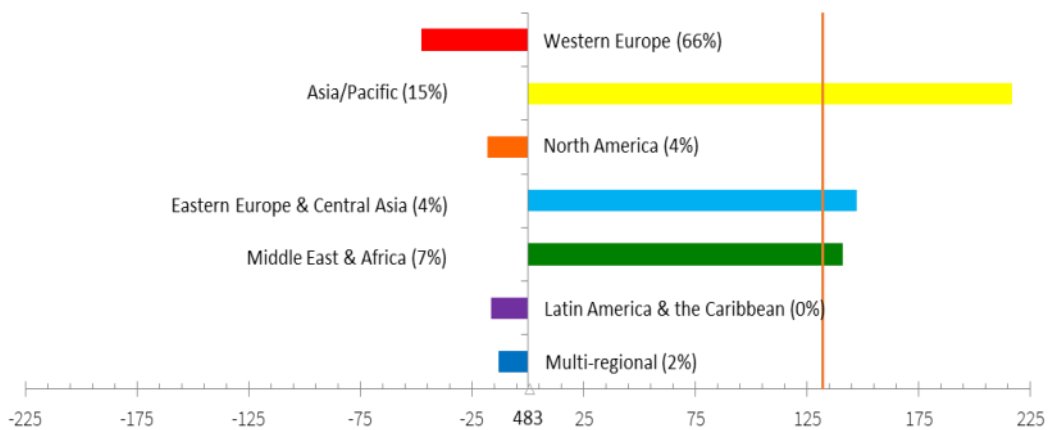
**Chart 35 |** **Western Europe Regional Assessments For Quality – Difference From The Mean**



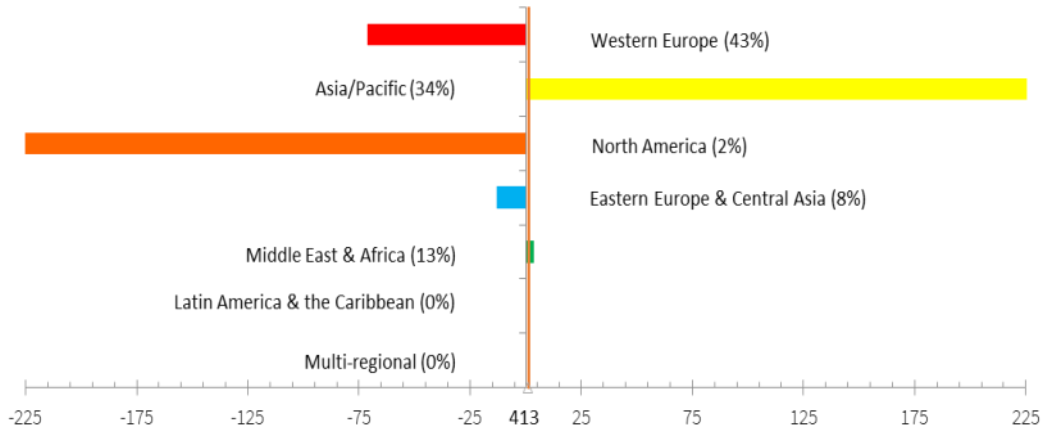**Chart 36 |** **Regional Assessments For Amsterdam For Depth – Difference From The Mean**
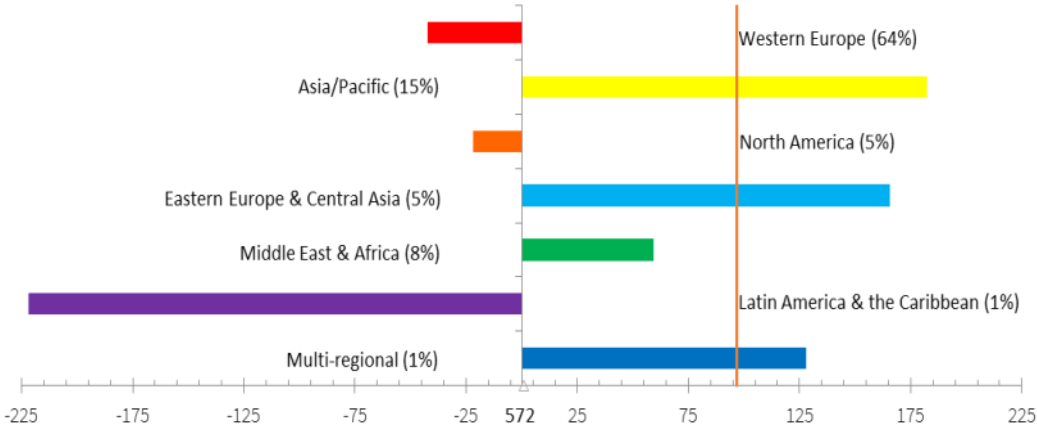


**Chart 37 |** **Regional Assessments For London For Quality – Difference From The Mean**
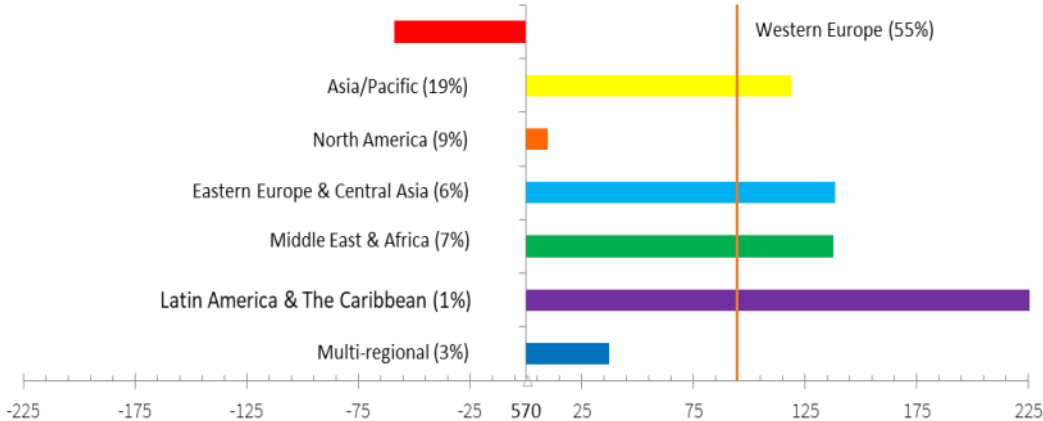
# Latin America & The Caribbean

- São Paulo continued to lead the region for both depth and quality and improved its ranking by three places in the quality measure. The case study that we published on São Paulo in April 2019 noted that interest in green finance in Brazil was sparked by hosting the Earth Summit in Rio de Janeiro in 1992. The establishment of the *Protocolo Verde* in 1995 requiring state-owned banks to consider green finance prompted action in the private sector.
- The British Virgin Islands and Mexico City fell in both the depth and quality rankings.
- Assessments from North America, Western Europe, and Latin America & The Caribbean were lower than average.

**Table 18 |** **Latin American & Caribbean Centres In GGFI 4**

| Centre | Depth | | Centre | Quality | |
| | GGFI 4 | | | GGFI 4 | |
| | Rank | Rating | | Rank | Rating |
|---|---|---|---|---|---|
| São Paulo | 46 | 374 | São Paulo | 43 | 390 |
| Cayman Islands | 54 | 356 | Cayman Islands | 50= | 378 |
| Rio de Janeiro | 55= | 353 | Rio de Janeiro | 55= | 358 |
| Mexico City | 58= | 349 | British Virgin Islands | 57 | 357 |
| Bermuda | 60 | 336 | Mexico City | 59 | 351 |
| British Virgin Islands | 61 | 335 | Bermuda | 63 | 342 |

**Chart 38 |** **Top Five Latin American & Caribbean Centres Ratings Over Time—Depth**
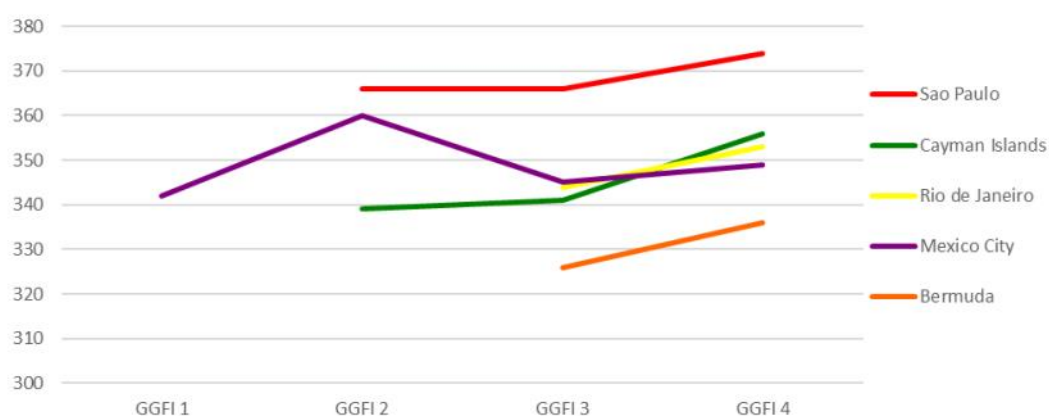
**Chart 39 | Top Five Latin American & Caribbean Centres Ratings Over Time—Quality**
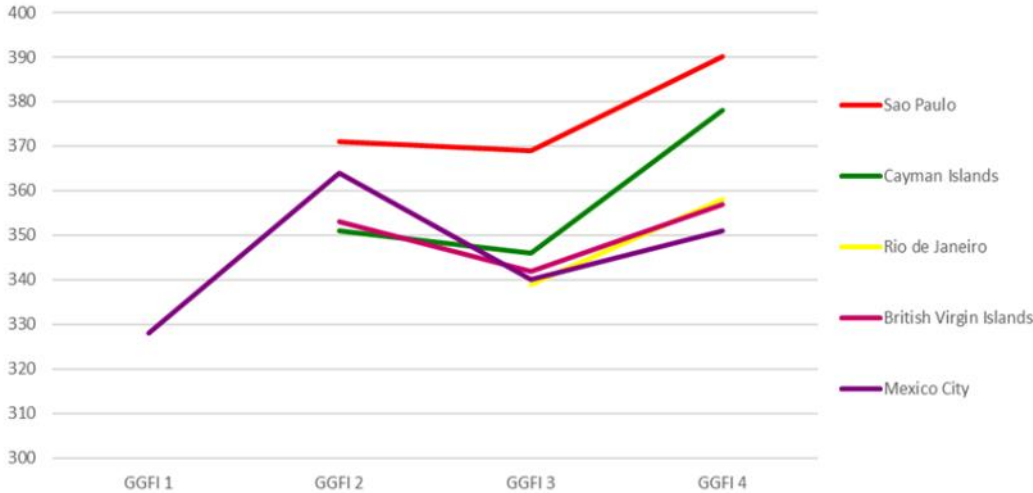


**Chart 40 | Latin American & Caribbean Regional Assessments For Depth – Difference From The Mean**
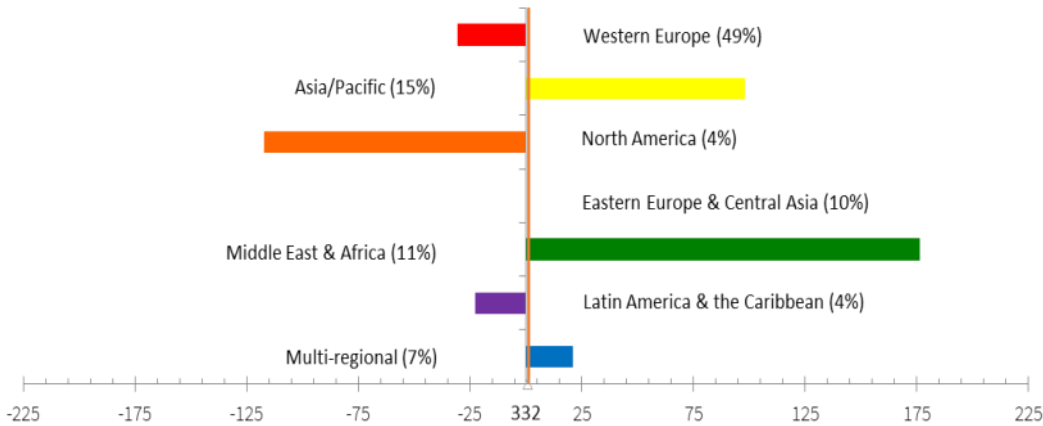


**Chart 41| Latin America & The Caribbean Regional Assessments For Quality – Difference From The Mean**
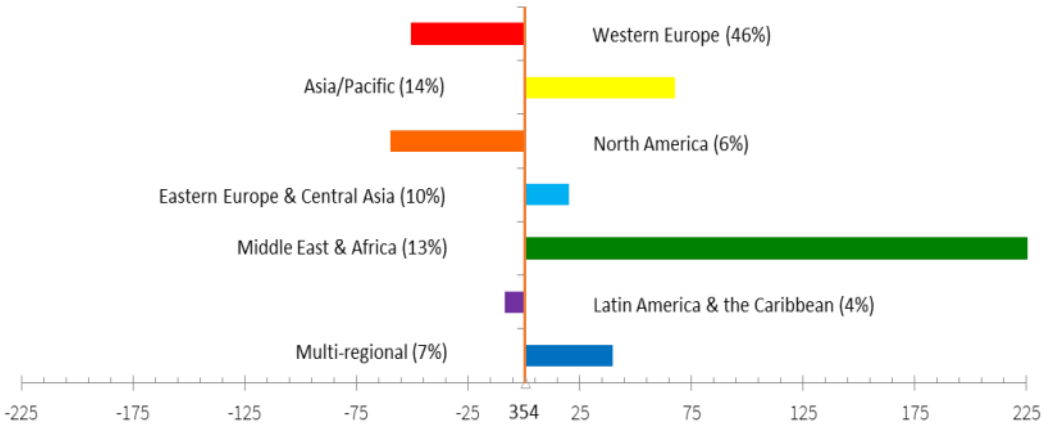
**Chart 42 | Regional Assessments For São Paulo For Depth – Difference From The Mean**
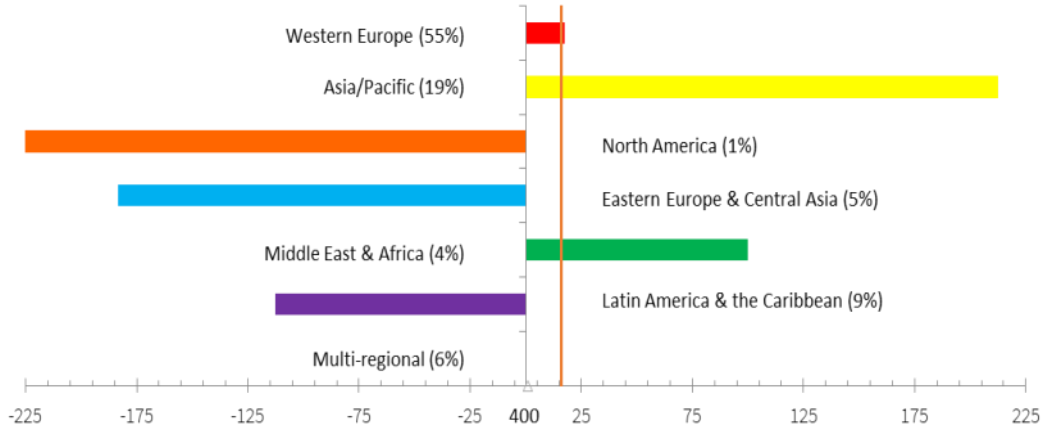


**Chart 43 | Regional Assessments For São Paulo For Quality – Difference From The Mean**
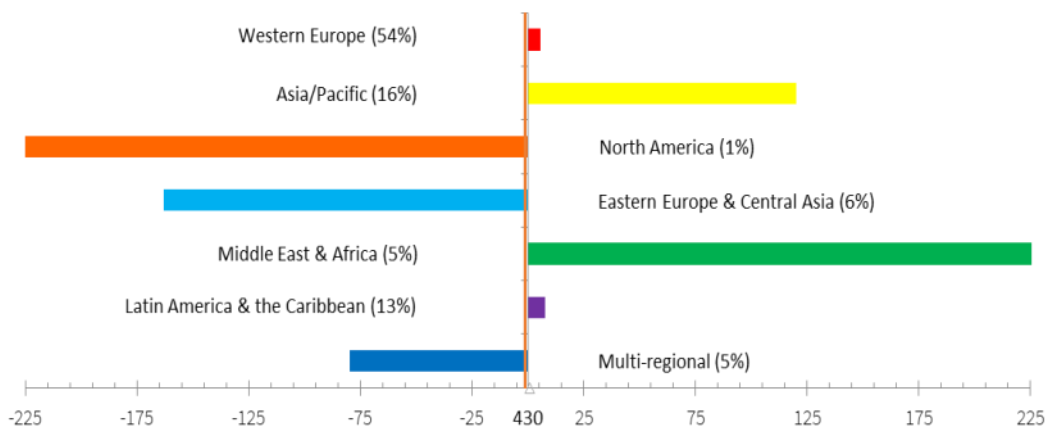


*"Do you speak ESG?  There is a need for sustainable finance courses at all levels (from the board to the employees and public opinion)."*

**Private Banker, Luxembourg**

# Asia/Pacific

- Shanghai retained its leading position in the region for depth. Melbourne overtook Sydney by one to take first place in the quality index in the region.
- Seoul fell in both the depth and quality rankings, although its ratings remained reasonably stable, suggesting that other centres have overtaken its position.
- Shanghai and Beijing fell eight places in the quality rankings and again were overtaken by other centres.
- Guangzhou rose overall in both rankings, coming seventh for depth and eighth for quality in the region.
- Assessments from Western Europe, North America, and Latin America & The Caribbean were lower for the region than those from other parts of the world.

**Table 19 |** **Asia/Pacific Top 10 Centres In GGFI 4**

| Centre | Depth GGFI 4 | | Centre | Quality GGFI 4 | |
| | Rank | Rating | | Rank | Rating |
|---|---|---|---|---|---|
| Shanghai | 11= | 422 | Melbourne | 15= | 433 |
| Sydney | 15= | 419 | Sydney | 17= | 432 |
| Guangzhou | 17= | 416 | Singapore | 21 | 424 |
| Beijing | 19 | 415 | Tokyo | 24 | 419 |
| Shenzhen | 21= | 413 | Beijing | 25= | 418 |
| Seoul | 21= | 413 | Shanghai | 28 | 417 |
| Singapore | 24 | 412 | Shenzhen | 31= | 412 |
| Melbourne | 25 | 411 | Guangzhou | 39 | 400 |
| Tokyo | 32 | 399 | Hong Kong | 40 | 399 |
| Hong Kong | 35 | 392 | Seoul | 44= | 388 |

**Chart 44 | Top Five Asia/Pacific Centres Ratings Over Time—Depth**
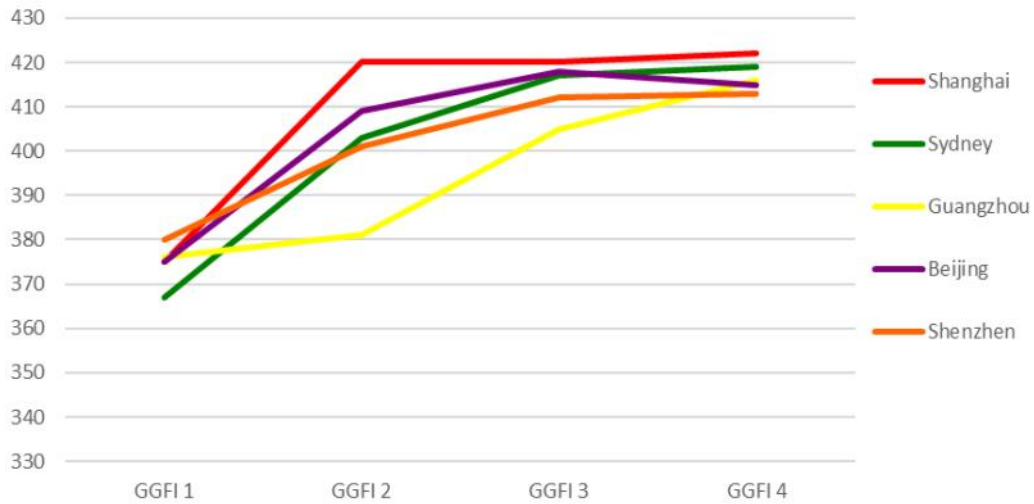


**Chart 45 | Top Five Asia/Pacific Centres Ratings Over Time—Quality**
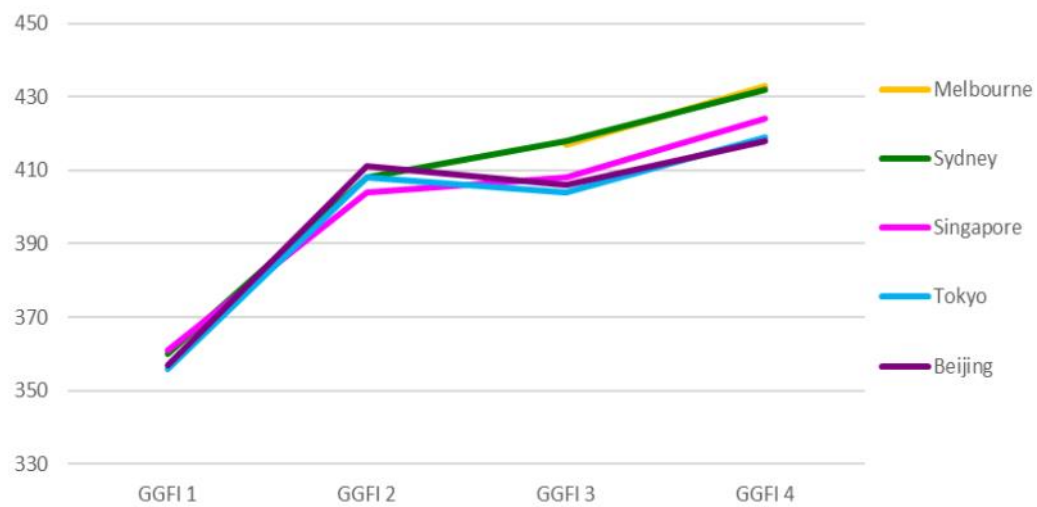


**Chart 46 | Asia/Pacific Regional Assessments For Depth – Difference From The Mean**
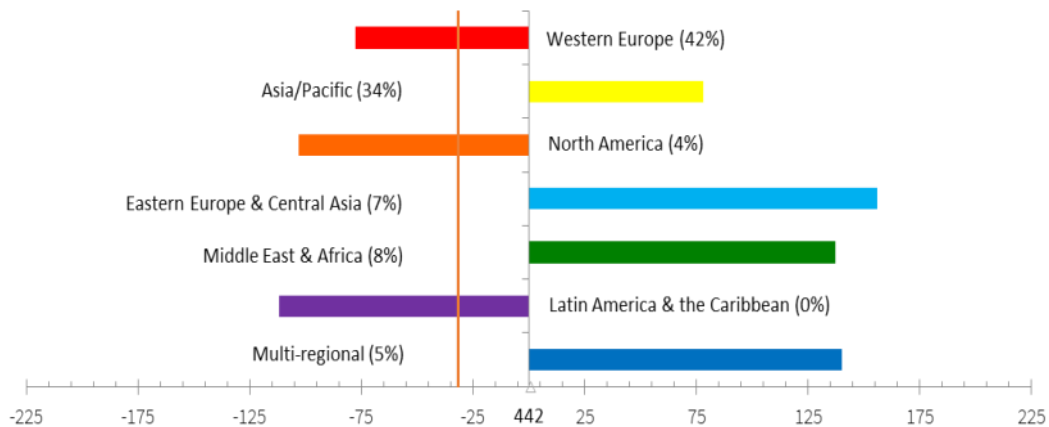
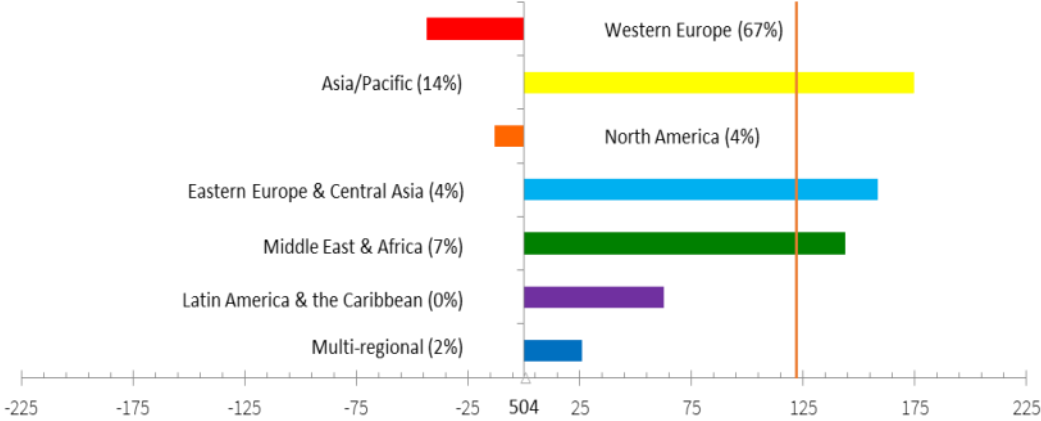**Chart 47 | Asia/Pacific Regional Assessments For Quality – Difference From The Mean**
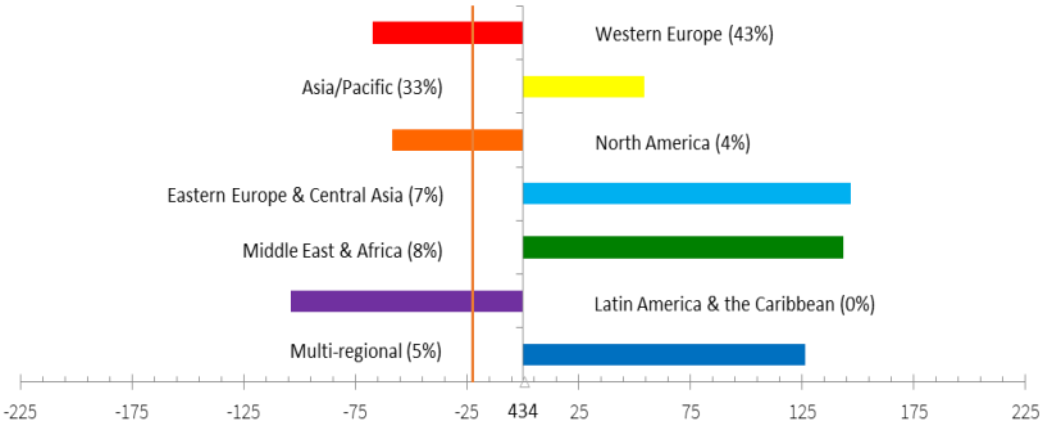


**Chart 48 | Regional Assessments For Shanghai For Depth – Difference From The Mean**
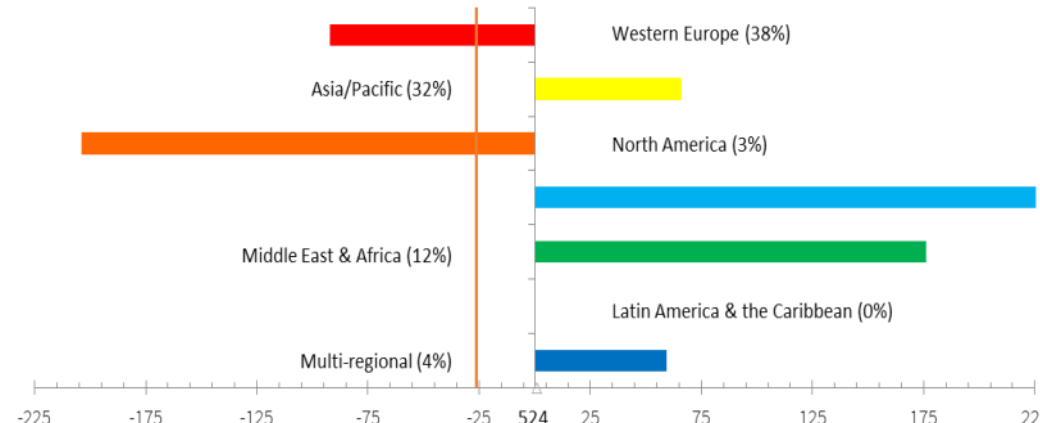


**Chart 49 | Regional Assessments For Melbourne For Quality – Difference From The Mean**
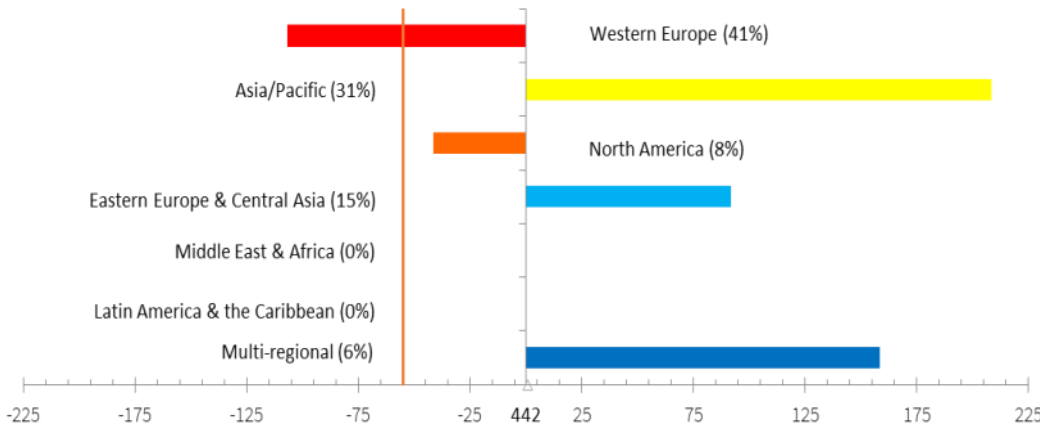
# Organisation Size

There is variation in how the leading centres are viewed by respondents working for different sizes of organisation.  Taking the eight centres that appear in the top five of the rankings for both depth and quality, Charts 50 and 51 show the average of the assessments given by respondents in different sizes of organisation.

The results show that Amsterdam received the most consistent ratings from respondents in all sizes of organisations.  Other centres had a more mixed range of responses, with London, for example, receiving lower ratings from those in organisations of 2,000 to 5,000 people and Hamburg, Luxembourg, and Zürich  scoring high in responses from those in organisations of 1,000 to 2,000 people. Copenhagen received the highest ratings from those working in large organisations of over 5,000 people.  These patterns of responses were broadly consistent between depth and quality ratings.

**Chart 50| Average Assessments By Respondents' Organisation Size: Depth**
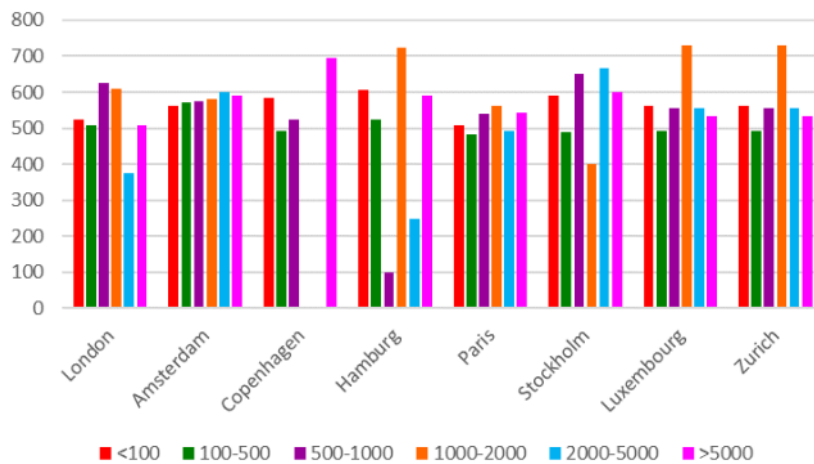


**Chart 51 | Average Assessments By Respondents' Organisation Size: Quality**
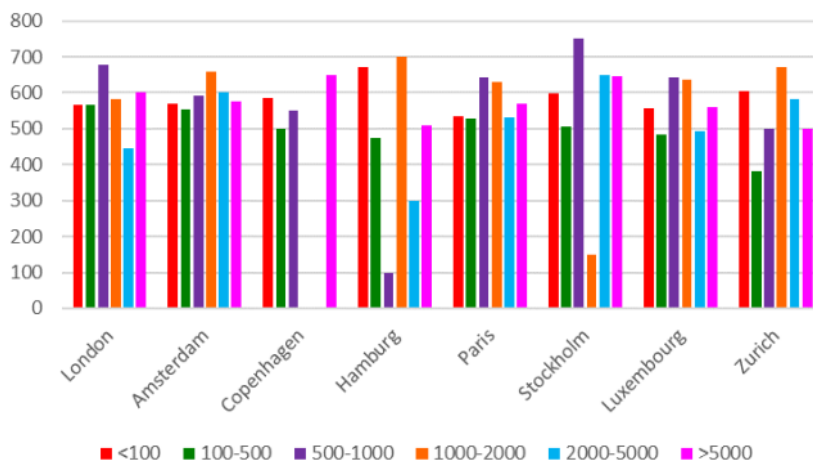
# Stability

The GGFI model allows for an analysis of the stability of financial centres in the index, which can be useful for centres when assessing their development strategies.  Charts 52 and 53 contrast the 'spread' or variance of the individual assessments given to each of the centres in GGFI 4, with the sensitivity to changes in the instrumental factors: first for depth and second for quality assessments.

The chart shows three bands of financial centres.  The unpredictable centres in the top right of the chart have a higher sensitivity to changes in the instrumental factors and a higher variance of assessments. These centres have the highest potential future movement.  The stable centres in the bottom left have a lower sensitivity to change and demonstrate greater consistency in their GGFI ratings.

There is greater unpredictability both in variance of ratings and sensitivity to instrumental factors for the depth measure than for quality.  Unpredictability on depth has decreased since GGFI 3, while the reverse is the case for the quality measure.

**Chart 52| Stability In Depth Assessments And Instrumental Factors**
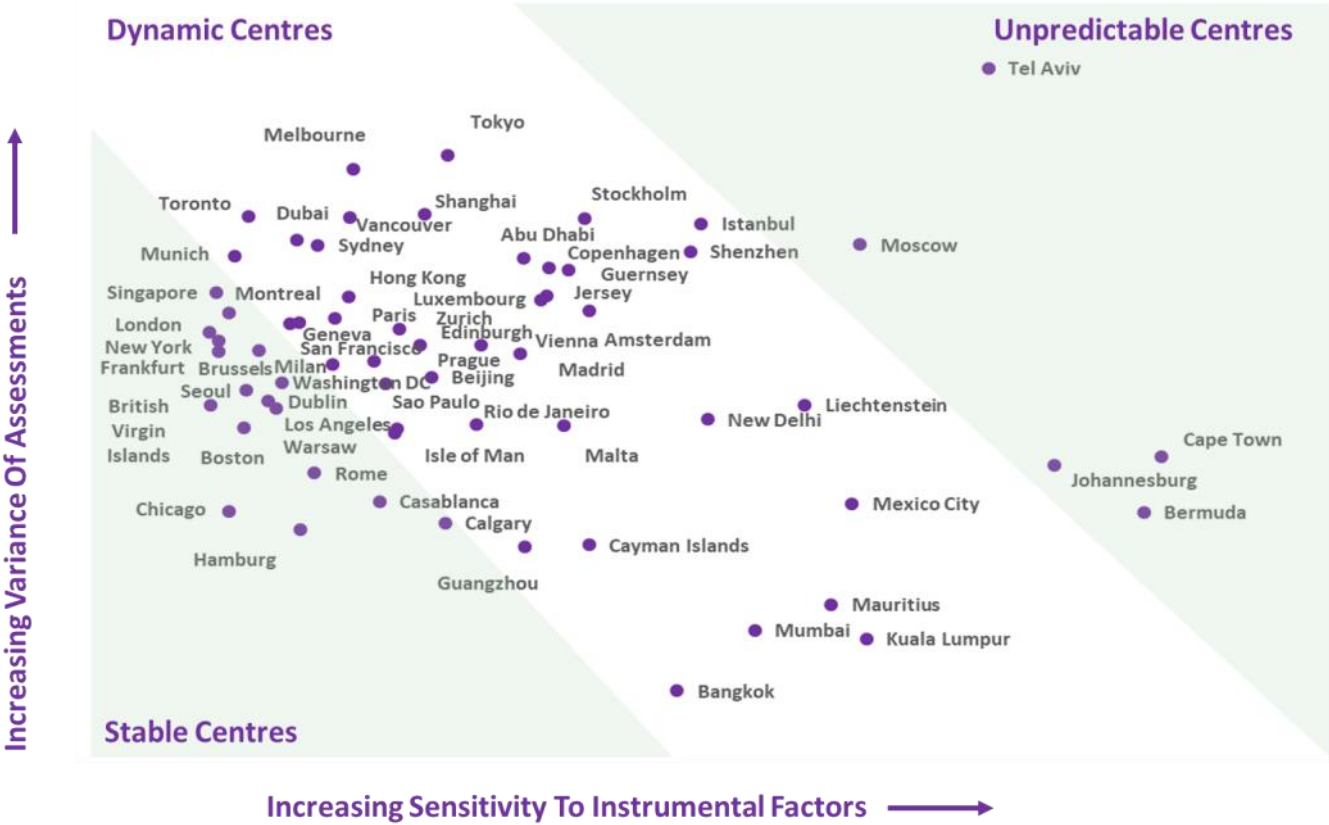
**Chart 53 | Stability In Quality Assessments And Instrumental Factors**
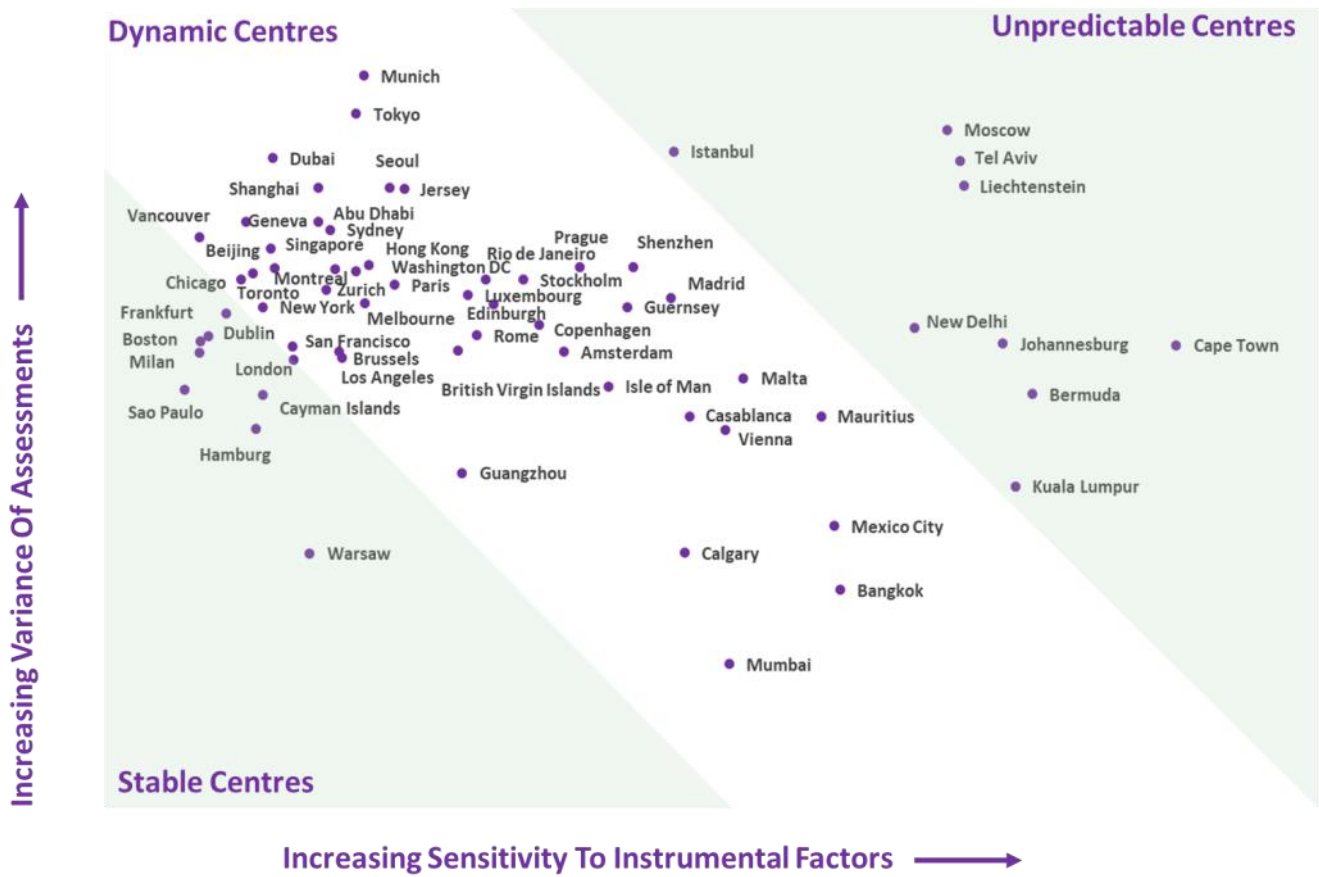


"High profile public and private sector leadership - in the latter, amongst individual and collective enterprises - is beginning to drive ever faster the green finance agenda, partly in response to a fast rising awareness of the consequences - not just the causes - of e.g. climate change.
This trend will accelerate."

**Senior Banker, London**

# Reputation

In the GGFI model, we look at reputation by examining the difference between the weighted average assessment given to a centre and its overall rating.  The first measure reflects the average score a centre receives from finance professionals around the world.  The second measure is the GGFI score itself, which represents the average assessment adjusted to reflect the instrumental factors.

If a centre has a higher average assessment than its GGFI rating, this indicates that respondents' perceptions of a centre are more favourable than the quantitative measures alone suggest.  Centres in this position may need to focus on their underlying strengths and build a solid foundation.

Six of the top 15 centres in terms of reputational advantage for depth are in the Western European region, with three each from the Middle East & Africa, North America and Asia/Pacific.  A similar range of centres feature for quality, but with Munich replacing Guangzhou in the top 15.

**Table 20 | Top 15 Centres – Reputational Advantage For Depth In GGFI 4**

| Centre | Weighted Average Assessment | GGFI 4 Rating | Reputational Advantage |
|---|---|---|---|
| Casablanca | 496 | 420 | 76 |
| Hamburg | 512 | 440 | 72 |
| Copenhagen | 527 | 455 | 72 |
| Stockholm | 510 | 453 | 57 |
| Montréal | 490 | 437 | 53 |
| Istanbul | 401 | 350 | 51 |
| Beijing | 459 | 415 | 44 |
| Shanghai | 465 | 422 | 43 |
| San Francisco | 458 | 416 | 42 |
| Tel Aviv | 439 | 401 | 38 |
| Los Angeles | 443 | 405 | 38 |
| Amsterdam | 505 | 471 | 34 |
| Guangzhou | 440 | 416 | 24 |
| Luxembourg | 482 | 459 | 23 |
| Zürich | 471 | 452 | 19 |

**Table 21| Top 15 Centres – Reputational Advantage For Quality In GGFI 4**

| Centre | Weighted Average Assessment | GGFI 4 Rating | Reputational Advantage |
|---|---|---|---|
| Casablanca | 496 | 432 | 64 |
| Stockholm | 522 | 465 | 57 |
| Copenhagen | 518 | 466 | 52 |
| San Francisco | 493 | 443 | 50 |
| Hamburg | 523 | 476 | 47 |
| Istanbul | 396 | 354 | 42 |
| Shanghai | 458 | 417 | 41 |
| Montréal | 475 | 438 | 37 |
| Amsterdam | 508 | 479 | 29 |
| Los Angeles | 433 | 408 | 25 |
| Zürich | 498 | 473 | 25 |
| Beijing | 442 | 418 | 24 |
| Tel Aviv | 436 | 418 | 18 |
| Luxembourg | 479 | 465 | 14 |
| Munich | 464 | 458 | 6 |

Tables 22 and 23 show the 15 centres with the greatest reputational disadvantage – an indication that respondents' perceptions of a centre are less favourable than the quantitative measures alone would suggest. These centres may need to market their strengths to ensure that their underlying quality is known to respondents.

A similar range of centres feature in the bottom 15 for depth and quality, though Rome, Dublin, and British Virgin Islands feature in the quality measure in place of Abu Dhabi, Moscow, and Jersey.

**Table 22 | Bottom 15 Centres – Reputational Disadvantage For Depth In GGFI 4**

| Centre | Weighted Average Assessment | GGFI 4 Rating | Reputational Advantage |
|---|---|---|---|
| Abu Dhabi | 310 | 362 | -52 |
| Cape Town | 309 | 367 | -58 |
| Guernsey | 311 | 371 | -60 |
| Moscow | 299 | 361 | -62 |
| Warsaw | 295 | 359 | -64 |
| Bermuda | 267 | 336 | -69 |
| Cayman Islands | 283 | 356 | -73 |
| Bangkok | 258 | 332 | -74 |
| Johannesburg | 274 | 349 | -75 |
| Jersey | 329 | 413 | -84 |
| Malta | 281 | 375 | -94 |
| New Delhi | 239 | 333 | -94 |
| Mumbai | 239 | 334 | -95 |
| Isle of Man | 283 | 390 | -107 |
| Calgary | 251 | 391 | -140 |

**Table 23 | Bottom 15 Centres – Reputational Disadvantage For Quality In GGFI 4**

| Centre | Weighted Average Assessment | GGFI 4 Rating | Reputational Advantage |
|---|---|---|---|
| Rome | 324 | 378 | -54 |
| Cape Town | 329 | 387 | -58 |
| Warsaw | 326 | 386 | -60 |
| Guernsey | 325 | 388 | -63 |
| Dublin | 341 | 408 | -67 |
| British Virgin Islands | 286 | 357 | -71 |
| Johannesburg | 307 | 378 | -71 |
| Cayman Islands | 304 | 378 | -74 |
| Bermuda | 249 | 342 | -93 |
| Malta | 308 | 401 | -93 |
| Bangkok | 255 | 348 | -93 |
| New Delhi | 234 | 334 | -100 |
| Isle of Man | 284 | 387 | -103 |
| Mumbai | 213 | 349 | -136 |
| Calgary | 260 | 404 | -144 |

# Industry Sectors

We can conduct an analysis of the differing assessments provided by respondents working in relevant industry sectors by building the index separately using the responses provided only from those industries. This creates separate sub-indices for the Professional Services, Knowledge (incorporating universities and NGOs), Banking, Investment, and Policy & Public Finance sectors.  Tables 24 and 25 show the top 15 centres in these industry sectors for depth and quality.

Amsterdam as the leader in the general depth index does not feature in the top 15 for policy & public finance, suggesting that the ratings it receives in this areas are considerably lower than from those working in professional services, knowledge, banking, and investment.

**Table 24 |** **GGFI 4 Industry Sector Sub-Indices - Depth**

| Rank | Professional Services | Knowledge | Banking | Investment | Policy & Public Finance |
|------|-----------------------|-----------|---------|------------|-------------------------|
| 1 | London | Copenhagen | Amsterdam | Amsterdam | Paris |
| 2 | Zürich | Stockholm | Hong Kong | Stockholm | Zürich |
| 3 | Luxembourg | Paris | Beijing | Copenhagen | Beijing |
| 4 | Amsterdam | Amsterdam | London | Hamburg | London |
| 5 | Stockholm | London | Shenzhen | London | Luxembourg |
| 6 | Casablanca | Zürich | Zürich | Brussels | Shanghai |
| 7 | Shanghai | Hamburg | Luxembourg | Munich | Seoul |
| 8 | Vienna | Casablanca | Guangzhou | Paris | Shenzhen |
| 9 | Copenhagen | Luxembourg | Toronto | Montréal | Singapore |
| 10 | San Francisco | Shenzhen | Sydney | Toronto | Guangzhou |
| 11 | Tokyo | San Francisco | Washington DC | Geneva | Edinburgh |
| 12 | Los Angeles | Shanghai | Shanghai | Zürich | Warsaw |
| 13 | Paris | Boston | San Francisco | Milan | Stockholm |
| 14 | Brussels | Frankfurt | Singapore | Madrid | Madrid |
| 15 | Madrid | Guangzhou | Copenhagen | Sydney | Copenhagen |

In the quality index, London achieves three of the top five rankings in the industry sub-indices, confirming a broad spread of consistency in its ranking.  However, it achieved four out of five in GGFI 3, and has lost ground to Luxembourg and Amsterdam in the banking sector.

**Table 25 | GGFI 4 Industry Sector Sub-Indices - Quality**

| Rank | Professional Services | Knowledge | Banking | Investment | Policy & Public Service |
|------|----------------------|-----------|---------|------------|------------------------|
| 1 | London | London | Luxembourg | London | Paris |
| 2 | Paris | Paris | Amsterdam | Amsterdam | London |
| 3 | Zürich | Edinburgh | London | Hamburg | Luxembourg |
| 4 | Shenzhen | Luxembourg | Beijing | Stockholm | Zürich |
| 5 | Casablanca | San Francisco | Zürich | Zürich | Beijing |
| 6 | Prague | Zürich | Sydney | Munich | Geneva |
| 7 | Luxembourg | Shenzhen | Hong Kong | Brussels | Copenhagen |
| 8 | Amsterdam | Amsterdam | Paris | Copenhagen | Hamburg |
| 9 | Shanghai | Guangzhou | Shenzhen | Montréal | Seoul |
| 10 | Guernsey | Hamburg | Washington DC | Edinburgh | Tel Aviv |
| 11 | Seoul | Boston | Toronto | Toronto | Edinburgh |
| 12 | Jersey | Dublin | Singapore | Madrid | Casablanca |
| 13 | Vienna | Copenhagen | Copenhagen | Vienna | San Francisco |
| 14 | San Francisco | Stockholm | New York | Geneva | New York |
| 15 | Tokyo | Brussels | Shanghai | Vancouver | Guangzhou |

> *"There is a need to build capacity through developing institutions - we are supporting this through the establishment of the Canadian Institute for Sustainable Finance at the Smith School of Business, Queen's University, Canada"*
>
> **Senior Manager. Philanthropic Trust, Toronto**

Taking the sectoral analysis further, we have calculated the index on the basis of the responses only from those working directly in green finance in financial services organisations.   The results are shown in tables 26 and 27 below for depth and quality respectively.

On this analysis, Shanghai, Casablanca, Guangzhou, Jersey, Seoul, Tel Aviv, and Abu  Dhabi would lose more than ten rank places in the index for depth if scored only on the responses from this group. Vienna, Calgary, and Madrid would improve more than ten places.

**Table 26 | GGFI 4 Using Responses Only From Financial Services Professionals Working In Green Finance - Depth**

| | Depth | | | | | | Depth | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| City | Depth | Rank | GGFI 4 Rank | Difference | | City | Depth | Rank | GGFI 4 Rank | Difference |
| Amsterdam | 477 | 1 | 1 | 0 | | Tokyo | 398 | 32 | 32 | 0 |
| Luxembourg | 474 | 2 | 2 | 0 | | Prague | 397 | 34 | 44 | -10 |
| Copenhagen | 473 | 3 | 3 | 0 | | Washington DC | 397 | 34 | 33 | 1 |
| Zürich | 471 | 4 | 5 | -1 | | Dublin | 397 | 34 | 38 | -4 |
| Paris | 468 | 5 | 7 | -2 | | Milan | 396 | 37 | 39 | -2 |
| Stockholm | 463 | 6 | 4 | 2 | | Hong Kong | 394 | 38 | 35 | 3 |
| Montréal | 454 | 7 | 9 | -2 | | Seoul | 392 | 39 | 21 | 18 |
| Hamburg | 452 | 8 | 7 | 1 | | Chicago | 392 | 39 | 42 | -3 |
| London | 449 | 9 | 6 | 3 | | New York | 388 | 41 | 41 | 0 |
| Geneva | 440 | 10 | 15 | -5 | | Isle of Man | 387 | 42 | 37 | 5 |
| Toronto | 439 | 11 | 13 | -2 | | Guernsey | 387 | 42 | 47 | -5 |
| Munich | 438 | 12 | 11 | 1 | | Malta | 382 | 44 | 44 | 0 |
| Brussels | 435 | 13 | 20 | -7 | | São Paulo | 378 | 45 | 46 | -1 |
| San Francisco | 435 | 13 | 17 | -4 | | Istanbul | 375 | 46 | 57 | -11 |
| Vancouver | 433 | 15 | 10 | 5 | | Mauritius | 372 | 47 | 43 | 4 |
| Vienna | 433 | 15 | 26 | -11 | | Moscow | 364 | 48 | 51 | -3 |
| Sydney | 428 | 17 | 15 | 2 | | Liechtenstein | 363 | 49 | 49 | 0 |
| Calgary | 425 | 18 | 36 | -18 | | Tel Aviv | 363 | 49 | 30 | 19 |
| Singapore | 415 | 19 | 24 | -5 | | Warsaw | 355 | 51 | 53 | -2 |
| Edinburgh | 415 | 19 | 26 | -7 | | Cayman Islands | 351 | 52 | 54 | -2 |
| Frankfurt | 414 | 21 | 26 | -5 | | Cape Town | 350 | 53 | 48 | 5 |
| Los Angeles | 413 | 22 | 29 | -7 | | Rio de Janeiro | 350 | 53 | 55 | -2 |
| Madrid | 412 | 23 | 40 | -17 | | Kuala Lumpur | 350 | 53 | 55 | -2 |
| Melbourne | 412 | 23 | 25 | -2 | | British Virgin Islands | 349 | 56 | 61 | -5 |
| Shanghai | 408 | 25 | 11 | 14 | | Mexico City | 346 | 57 | 58 | -1 |
| Rome | 408 | 25 | 31 | -6 | | Johannesburg | 346 | 57 | 58 | -1 |
| Boston | 407 | 27 | 34 | -7 | | New Delhi | 331 | 59 | 63 | -4 |
| Casablanca | 405 | 28 | 13 | 15 | | Mumbai | 331 | 59 | 62 | -3 |
| Beijing | 404 | 29 | 19 | 10 | | Bangkok | 330 | 61 | 64 | -3 |
| Shenzhen | 400 | 30 | 21 | 9 | | Dubai | 328 | 62 | 52 | 10 |
| Guangzhou | 399 | 31 | 17 | 14 | | Bermuda | 326 | 63 | 60 | 3 |
| Jersey | 398 | 32 | 21 | 11 | | Abu Dhabi | 324 | 64 | 49 | 15 |

Turning to quality, Singapore, Tokyo, and Beijing would lose more than ten places, while Boston, Calgary, Malta, Guernsey, and Istanbul would gain more than ten places.

We will continue to track the responses from green finance professionals alongside the GGFI main index results.

**Table 27 | GGFI 4 Using Responses Only From Financial Services Professionals Working In Green Finance - Quality**

| City | Depth | Rank | GGFI 4 Rank | Difference |
|------|-------|------|-------------|------------|
| London | 505 | 1 | 1 | 0 |
| Stockholm | 497 | 2 | 7 | -5 |
| Copenhagen | 491 | 3 | 6 | -3 |
| Zürich | 491 | 3 | 5 | -2 |
| Amsterdam | 490 | 5 | 2 | 3 |
| Paris | 479 | 6 | 3 | 3 |
| Luxembourg | 474 | 7 | 7 | 0 |
| Munich | 468 | 8 | 9 | -1 |
| Geneva | 465 | 9 | 11 | -2 |
| Hamburg | 465 | 9 | 4 | 5 |
| San Francisco | 458 | 11 | 11 | 0 |
| Brussels | 456 | 12 | 10 | 2 |
| Vancouver | 450 | 13 | 14 | -1 |
| Montréal | 450 | 13 | 13 | 0 |
| Vienna | 448 | 15 | 19 | -4 |
| Toronto | 445 | 16 | 20 | -4 |
| Prague | 442 | 17 | 22 | -5 |
| Casablanca | 440 | 18 | 17 | 1 |
| Sydney | 433 | 19 | 17 | 2 |
| Melbourne | 433 | 19 | 15 | 4 |
| Madrid | 432 | 21 | 25 | -4 |
| Frankfurt | 429 | 22 | 22 | 0 |
| Boston | 428 | 23 | 35 | -12 |
| Edinburgh | 425 | 24 | 15 | 9 |
| Calgary | 425 | 24 | 37 | -13 |
| Jersey | 421 | 26 | 35 | -9 |
| Los Angeles | 419 | 27 | 33 | -6 |
| Malta | 419 | 27 | 38 | -11 |
| Tel Aviv | 419 | 27 | 25 | 2 |
| New York | 417 | 30 | 29 | 1 |
| Washington DC | 416 | 31 | 30 | 1 |
| Guernsey | 415 | 32 | 44 | -12 |

| City | Depth | Rank | GGFI 4 Rank | Difference |
|------|-------|------|-------------|------------|
| Singapore | 414 | 33 | 21 | 12 |
| Milan | 414 | 33 | 31 | 2 |
| Shenzhen | 412 | 35 | 31 | 4 |
| Dublin | 411 | 36 | 33 | 3 |
| Tokyo | 404 | 37 | 24 | 13 |
| Istanbul | 404 | 37 | 58 | -21 |
| Shanghai | 404 | 37 | 28 | 9 |
| Isle of Man | 402 | 40 | 46 | -6 |
| Chicago | 401 | 41 | 41 | 0 |
| Hong Kong | 400 | 42 | 40 | 2 |
| São Paulo | 398 | 43 | 43 | 0 |
| Liechtenstein | 397 | 44 | 42 | 2 |
| Beijing | 396 | 45 | 25 | 20 |
| Warsaw | 392 | 46 | 48 | -2 |
| Mauritius | 390 | 47 | 49 | -2 |
| Cayman Islands | 389 | 48 | 50 | -2 |
| Guangzhou | 388 | 49 | 39 | 10 |
| Rome | 385 | 50 | 50 | 0 |
| Seoul | 381 | 51 | 44 | 7 |
| Cape Town | 375 | 52 | 46 | 6 |
| Kuala Lumpur | 374 | 53 | 54 | -1 |
| Johannesburg | 359 | 54 | 50 | 4 |
| Mumbai | 358 | 55 | 60 | -5 |
| Rio de Janeiro | 358 | 55 | 55 | 0 |
| Mexico City | 356 | 57 | 59 | -2 |
| Bermuda | 356 | 57 | 63 | -6 |
| Moscow | 354 | 59 | 62 | -3 |
| British Virgin Islands | 353 | 60 | 57 | 3 |
| Abu Dhabi | 347 | 61 | 55 | 6 |
| Bangkok | 340 | 62 | 61 | 1 |
| Dubai | 333 | 63 | 53 | 10 |
| New Delhi | 321 | 64 | 64 | 0 |

# GGFI 4 Interest, Impact, And Drivers Of Green Finance

Alongside the ratings of depth and quality in the GGFI questionnaire, we ask additional questions about the development of green finance, covering:
• the areas of green finance which were considered most interesting by respondents;
• the areas of green finance which had most impact on sustainability; and
• the factors driving the development of green finance.

**Areas Of Interest In Green Finance And Areas With The Most Impact**

We asked respondents to identify the four areas of green finance which they considered most interesting; and the four areas of green finance that they consider have most impact on sustainability. The results are shown in Charts 54 and 55.

For both interest and impact, the three areas most frequently cited were:
• sustainable infrastructure finance;
• green bonds; and
• renewable energy investment.

These three areas have featured as the most frequently mentioned for both interest and impact in all four editions of the GGFI so far.

**Chart 54 |  Most Interesting Areas Of Green Finance**
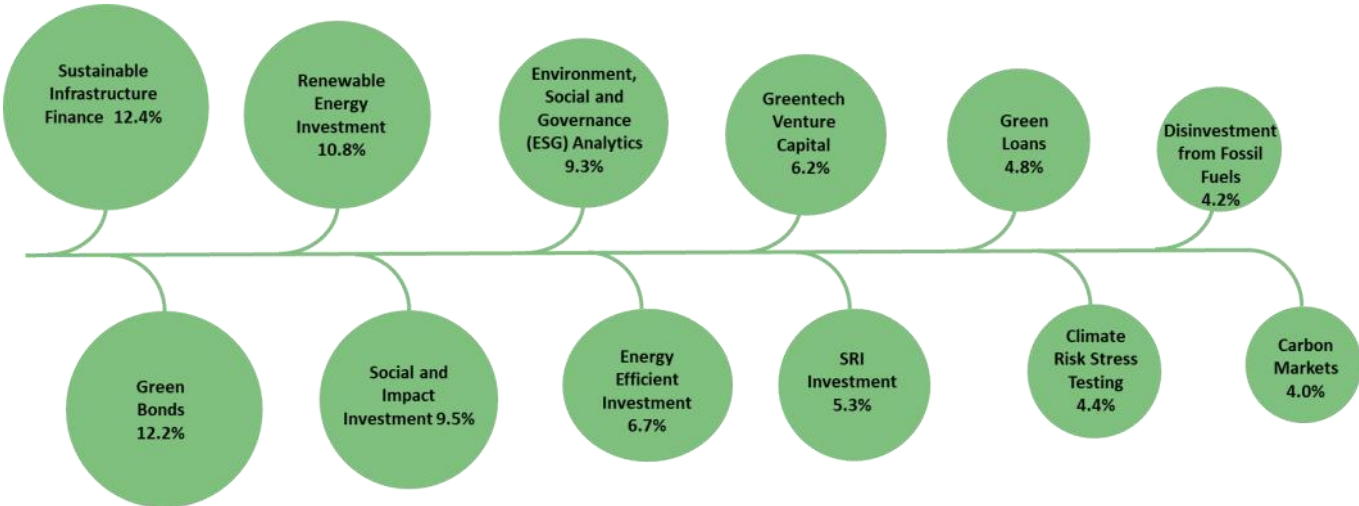
**Chart 55** | **Green Finance Activities With Most Impact On Sustainability**



Green Bonds 11.4%
Sustainable Infrastructure Finance 11.1%
Social and Impact Investment 8.0%
Energy Efficient Investment 7.3%
Carbon Disclosure 5.0%
Green Loans 4.6%

Renewable Energy Investment 11.1%
Environment, Social and Governance (ESG) Analytics 8.5%
Disinvestment from Fossil Fuels 7.5%
Climate Risk Stress Testing 5.8%
Greentech Venture Capital 5.0%
SRI Investment 4.6%
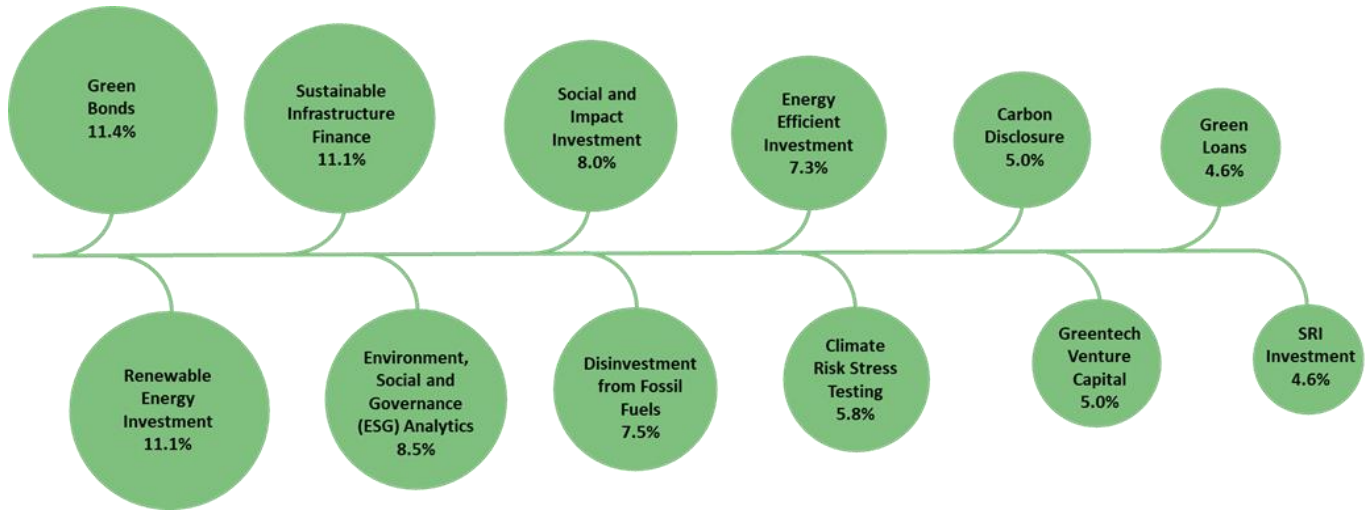
## Relationship Between Areas Of Interest And Impact

Looking at the areas of Green Finance that respondents identified as interesting and those they considered had most impact, we see a close correlation, as shown in Chart 56. Disinvestment from Fossil Fuels stands out as further from the trendline, indicating that disinvestment is seen as having greater impact than the interest shown in it.

This reinforces the importance of disinvestment, as noted in our special report in GGFI 3, which noted the clear view of respondents to our survey that policy makers should support disinvestment through active discouragement of carbon investment, pricing, and mandatory disclosure.

It is worth noting that natural capital valuation remains of low interest and impact for respondents, despite the challenges for biodiversity set out in our report.

**Chart 56** | **Relationship Between Areas Of Interest And Impact**
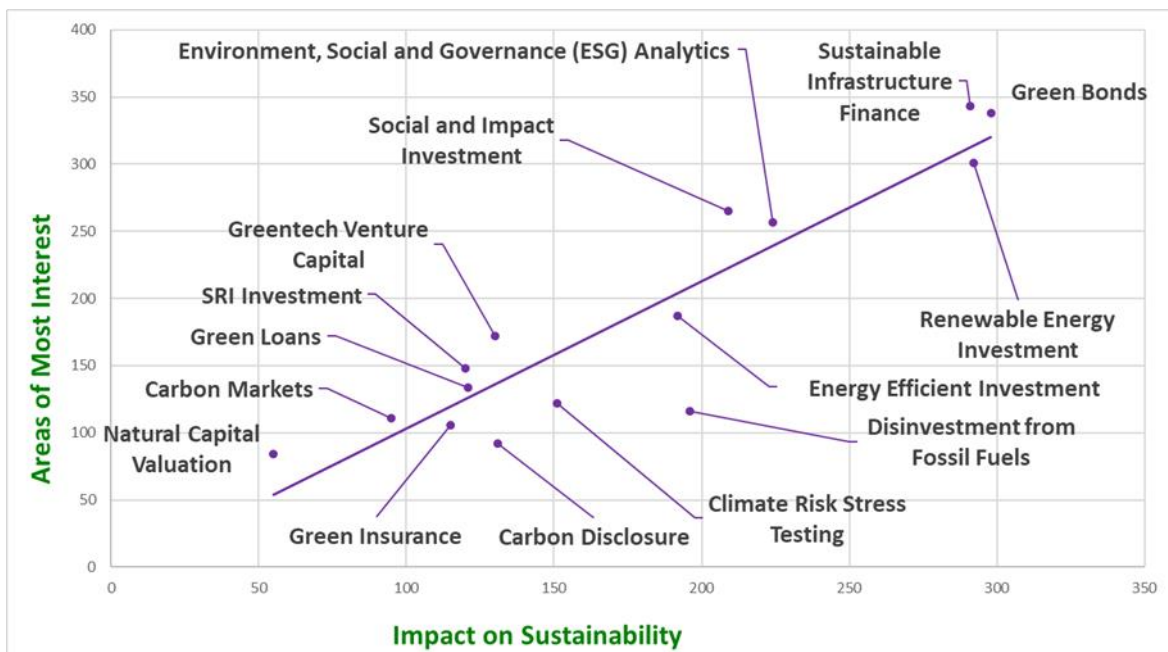
## Drivers Of Green Finance

Finally, we asked respondents to identify the four areas that they considered were driving the development of Green Finance. The results are shown in Chart 57 below. The top drivers identified were:

• policy and regulatory frameworks;
• investor demand;
• climate change; and
• public awareness.

These top four factors have been consistent in all four editions of the GGFI.

**Chart 57 |  Leading Drivers Of Green Finance**



Policy and Regulatory Frameworks 13.3%

Climate Change 9.7%

Technological Change 5.5%

International Initiatives 5.0%

Sustainability Reporting 4.3%

Risk Management Frameworks 3.2%

Investor Demand 9.8%

Public Awareness 7.7%

Mandatory Disclosure 5.4%

Tax Incentives 4.8%

Infrastructure Investment 3.6%

NGO Activism 3.1%
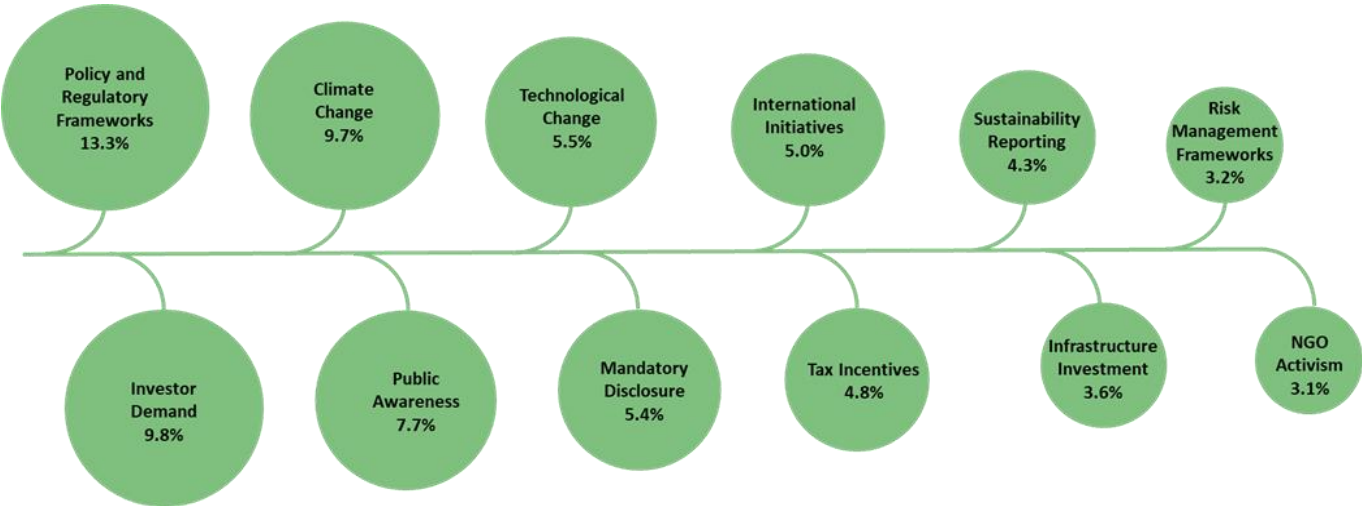
# Appendix 1: Assessment Details

**Table 28 |** **Details Of Assessments Of Green Finance Depth By Centre**

| Centre | GGFI 4 Rank | GGFI 4 Rating | ——— Assessments ——— | | |
| --- | --- | --- | --- | --- | --- |
| | | | Number | Average | St. Dev |
| Amsterdam | 1 | 471 | 105 | 572 | 257 |
| Luxembourg | 2 | 459 | 122 | 553 | 259 |
| Copenhagen | 3 | 455 | 35 | 597 | 267 |
| Stockholm | 4 | 453 | 50 | 579 | 279 |
| Zürich | 5 | 452 | 143 | 535 | 252 |
| London | 6 | 447 | 232 | 517 | 252 |
| Paris | 7= | 440 | 171 | 514 | 255 |
| Hamburg | 7= | 440 | 26 | 573 | 204 |
| Montréal | 9 | 437 | 46 | 545 | 256 |
| Vancouver | 10 | 424 | 32 | 452 | 280 |
| Shanghai | 11= | 422 | 88 | 524 | 280 |
| Munich | 11= | 422 | 31 | 482 | 270 |
| Casablanca | 13= | 420 | 24 | 560 | 211 |
| Toronto | 13= | 420 | 58 | 482 | 280 |
| Sydney | 15= | 419 | 51 | 491 | 273 |
| Geneva | 15= | 419 | 99 | 472 | 254 |
| Guangzhou | 17= | 416 | 21 | 507 | 200 |
| San Francisco | 17= | 416 | 59 | 515 | 254 |
| Beijing | 19 | 415 | 84 | 523 | 241 |
| Brussels | 20 | 414 | 70 | 478 | 247 |
| Shenzhen | 21= | 413 | 35 | 490 | 271 |
| Seoul | 21= | 413 | 24 | 433 | 238 |
| Jersey | 21= | 413 | 43 | 388 | 260 |
| Singapore | 24 | 412 | 138 | 466 | 261 |
| Melbourne | 25 | 411 | 24 | 463 | 291 |
| Frankfurt | 26= | 406 | 150 | 454 | 247 |
| Edinburgh | 26= | 406 | 49 | 460 | 249 |
| Vienna | 26= | 406 | 31 | 429 | 249 |
| Los Angeles | 29 | 405 | 49 | 498 | 233 |
| Tel Aviv | 30 | 401 | 20 | 493 | 316 |
| Rome | 31 | 400 | 21 | 414 | 217 |
| Tokyo | 32 | 399 | 76 | 442 | 295 |

| Centre | GGFI 4 | GGFI 4 Rating | ——— Assessments ——— | | |
| --- | --- | --- | --- | --- | --- |
| | | | Number | Average | St. Dev |
| Washington DC | 33 | 397 | 52 | 428 | 240 |
| Boston | 34 | 393 | 65 | 430 | 228 |
| Hong Kong | 35 | 392 | 144 | 422 | 260 |
| Calgary | 36 | 391 | 23 | 285 | 205 |
| Isle of Man | 37 | 390 | 38 | 330 | 228 |
| Dublin | 38 | 388 | 90 | 390 | 235 |
| Milan | 39 | 387 | 47 | 418 | 244 |
| Madrid | 40 | 385 | 36 | 450 | 246 |
| New York | 41 | 381 | 226 | 413 | 250 |
| Chicago | 42 | 379 | 62 | 371 | 208 |
| Mauritius | 43 | 376 | 23 | 398 | 186 |
| Malta | 44= | 375 | 26 | 312 | 229 |
| Prague | 44= | 375 | 23 | 413 | 245 |
| São Paulo | 46 | 374 | 32 | 400 | 239 |
| Guernsey | 47 | 371 | 31 | 352 | 267 |
| Cape Town | 48 | 367 | 21 | 355 | 221 |
| Liechtenstein | 49 | 362 | 20 | 415 | 234 |
| Abu Dhabi | 49 | 362 | 54 | 346 | 270 |
| Moscow | 51 | 361 | 31 | 332 | 273 |
| Dubai | 52 | 360 | 95 | 376 | 274 |
| Warsaw | 53 | 359 | 25 | 332 | 227 |
| Cayman Islands | 54 | 356 | 35 | 311 | 200 |
| Rio de Janeiro | 55= | 353 | 26 | 354 | 229 |
| Kuala Lumpur | 55= | 353 | 37 | 359 | 177 |
| Istanbul | 57 | 350 | 23 | 448 | 278 |
| Johannesburg | 58= | 349 | 35 | 310 | 219 |
| Mexico City | 58= | 349 | 36 | 344 | 210 |
| Bermuda | 60 | 336 | 21 | 295 | 208 |
| British Virgin Islands | 61 | 335 | 31 | 311 | 234 |
| Mumbai | 62 | 334 | 28 | 275 | 179 |
| New Delhi | 63 | 333 | 25 | 278 | 231 |
| Bangkok | 64 | 332 | 26 | 294 | 165 |

**Table 29 |** Details Of Assessments Of Green Finance Quality By Centre

| Centre | GGFI 4 Rank | GGFI 4 Rating | Assessments | | | Centre | GGFI 4 Rank | GGFI 4 Rating | Assessments | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Number | Average | St. Dev | | | | Numbe | Averag | St. Dev |
| London | 1 | 497 | 232 | 570 | 241 | Dublin | 33= | 408 | 90 | 393 | 250 |
| Amsterdam | 2 | 479 | 105 | 574 | 242 | Los Angeles | 33= | 408 | 49 | 487 | 241 |
| Paris | 3 | 477 | 171 | 549 | 257 | Jersey | 35= | 406 | 43 | 431 | 277 |
| Hamburg | 4 | 476 | 26 | 590 | 226 | Boston | 35= | 406 | 65 | 429 | 245 |
| Zürich | 5 | 473 | 143 | 565 | 256 | Calgary | 37 | 404 | 23 | 296 | 199 |
| Copenhagen | 6 | 466 | 35 | 587 | 248 | Malta | 38 | 401 | 26 | 340 | 237 |
| Stockholm | 7= | 465 | 50 | 594 | 258 | Guangzhou | 39 | 400 | 21 | 443 | 216 |
| Luxembourg | 7= | 465 | 122 | 550 | 254 | Hong Kong | 40 | 399 | 144 | 423 | 261 |
| Munich | 9 | 458 | 31 | 524 | 301 | Chicago | 41 | 393 | 62 | 390 | 258 |
| Brussels | 10 | 444 | 70 | 484 | 242 | Liechtenstein | 42 | 392 | 20 | 435 | 278 |
| Geneva | 11= | 443 | 99 | 503 | 270 | São Paulo | 43 | 390 | 32 | 430 | 234 |
| San Francisco | 11= | 443 | 59 | 553 | 243 | Guernsey | 44= | 388 | 31 | 368 | 252 |
| Montréal | 13 | 438 | 46 | 526 | 260 | Seoul | 44= | 388 | 24 | 408 | 277 |
| Vancouver | 14 | 435 | 32 | 459 | 267 | Cape Town | 46= | 387 | 21 | 374 | 244 |
| Edinburgh | 15= | 433 | 49 | 480 | 252 | Isle of Man | 46= | 387 | 38 | 332 | 235 |
| Melbourne | 15= | 433 | 24 | 442 | 253 | Warsaw | 48 | 386 | 25 | 364 | 199 |
| Casablanca | 17= | 432 | 24 | 560 | 228 | Mauritius | 49 | 379 | 23 | 426 | 229 |
| Sydney | 17= | 432 | 51 | 480 | 268 | Johannesburg | 50= | 378 | 35 | 350 | 244 |
| Vienna | 19 | 428 | 31 | 434 | 226 | Rome | 50= | 378 | 21 | 374 | 246 |
| Toronto | 20 | 426 | 58 | 471 | 259 | Cayman Islands | 50 | 378 | 35 | 334 | 233 |
| Singapore | 21 | 424 | 138 | 472 | 260 | Dubai | 53 | 372 | 95 | 384 | 284 |
| Prague | 22= | 420 | 23 | 485 | 260 | Kuala Lumpur | 54 | 359 | 37 | 346 | 214 |
| Frankfurt | 22= | 420 | 150 | 466 | 246 | Abu Dhabi | 55= | 358 | 54 | 357 | 270 |
| Tokyo | 24 | 419 | 76 | 457 | 293 | Rio de Janeiro | 55= | 358 | 26 | 356 | 258 |
| Beijing | 25= | 418 | 84 | 503 | 264 | British Virgin Islands | 57 | 357 | 31 | 313 | 243 |
| Madrid | 25= | 418 | 36 | 458 | 254 | Istanbul | 58 | 354 | 23 | 441 | 285 |
| Tel Aviv | 25= | 418 | 20 | 493 | 283 | Mexico City | 59 | 351 | 36 | 342 | 205 |
| Shanghai | 28 | 417 | 88 | 515 | 277 | Mumbai | 60 | 349 | 28 | 245 | 176 |
| New York | 29 | 416 | 226 | 460 | 252 | Bangkok | 61 | 348 | 26 | 294 | 191 |
| Washington DC | 30 | 415 | 52 | 458 | 260 | Moscow | 62 | 346 | 31 | 332 | 290 |
| Shenzhen | 31= | 412 | 35 | 466 | 260 | Bermuda | 63 | 342 | 21 | 276 | 233 |
| Milan | 31= | 412 | 47 | 462 | 242 | New Delhi | 64 | 334 | 25 | 270 | 247 |

# Appendix 2: Interest, Impact, And Drivers Details

### Table 30 | Interesting Areas Of Green Finance

| Area Of Green Finance | Number Of Mentions | Percentage Of Total Mentions |
|---|---|---|
| Natural Capital Valuation | 84 | 3.0% |
| Carbon Disclosure | 92 | 3.3% |
| Green Insurance | 106 | 3.8% |
| Carbon Markets | 111 | 4.0% |
| Disinvestment from Fossil Fuels | 116 | 4.2% |
| Climate Risk Stress Testing | 122 | 4.4% |
| Green Loans | 134 | 4.8% |
| SRI Investment | 148 | 5.3% |
| Greentech Venture Capital | 172 | 6.2% |
| Energy Efficient Investment | 187 | 6.7% |
| Environment, Social and Governance (ESG) Analytics | 257 | 9.3% |
| Social and Impact Investment | 265 | 9.5% |
| Renewable Energy Investment | 301 | 10.8% |
| Green Bonds | 338 | 12.2% |
| Sustainable Infrastructure Finance | 343 | 12.4% |
| **Totals** | **2,776** | **100.0%** |

### Table 31 | Areas Of Green Finance With Most Impact On Sustainability

| Area Of Green Finance | Number Of Mentions | Percentage Of Total Mentions |
|---|---|---|
| Natural Capital Valuation | 55 | 2.1% |
| Carbon Markets | 95 | 3.6% |
| Green Insurance | 115 | 4.4% |
| SRI Investment | 120 | 4.6% |
| Green Loans | 121 | 4.6% |
| Greentech Venture Capital | 130 | 5.0% |
| Carbon Disclosure | 131 | 5.0% |
| Climate Risk Stress Testing | 151 | 5.8% |
| Energy Efficient Investment | 192 | 7.3% |
| Disinvestment from Fossil Fuels | 196 | 7.5% |
| Social and Impact Investment | 209 | 8.0% |
| Environment, Social and Governance (ESG) Analytics | 224 | 8.5% |
| Sustainable Infrastructure Finance | 291 | 11.1% |
| Renewable Energy Investment | 292 | 11.1% |
| Green Bonds | 298 | 11.4% |
| **Totals** | **2,620** | **100.0%** |

**Table 32 | Drivers Of Green Finance**

| Driver | Number Of Mentions | Percentage Of Total Mentions |
|---|---|---|
| Loss of Biodiversity | 17 | 0.6% |
| Food Security | 21 | 0.8% |
| Water Quality | 31 | 1.2% |
| Insurance Industry Research | 38 | 1.4% |
| Voluntary Standards | 41 | 1.5% |
| Air Quality | 51 | 1.9% |
| Academic Research | 69 | 2.6% |
| Industry Activism | 74 | 2.8% |
| Non-financial Reporting | 76 | 2.9% |
| Energy Efficiency | 76 | 2.9% |
| Finance Centre Activism | 78 | 2.9% |
| Renewables | 81 | 3.0% |
| NGO Activism | 83 | 3.1% |
| Risk Management Frameworks | 86 | 3.2% |
| Infrastructure Investment | 97 | 3.6% |
| Sustainability Reporting | 114 | 4.3% |
| Tax Incentives | 127 | 4.8% |
| International Initiatives | 133 | 5.0% |
| Mandatory Disclosure | 143 | 5.4% |
| Technological Change | 145 | 5.5% |
| Public Awareness | 204 | 7.7% |
| Climate Change | 259 | 9.7% |
| Investor Demand | 262 | 9.8% |
| Policy and Regulatory Frameworks | 354 | 13.3% |
| **Totals** | **2,660** | **100.0%** |

# Appendix 3: Respondents' Details

## Table 33| Respondents By Industry Sector

| Industry Sector | Number Of Respondents | Percentage Of Respondents |
|---|---|---|
| Banking | 90 | 12.24% |
| Debt Capital Market | 46 | 6.26% |
| Equity Capital Markets | 31 | 4.22% |
| Insurance | 12 | 1.63% |
| Investment | 95 | 12.93% |
| Knowledge | 139 | 18.91% |
| Local Green Initiatives | 21 | 2.86% |
| Other | 49 | 6.67% |
| Policy & Public Finance | 68 | 9.25% |
| Professional Services | 175 | 23.81% |
| Trading | 9 | 1.22% |
| **Total** | **735** | **100.00%** |

## Table 34 | Respondents By Region

| Region | Number Of Respondents | Percentage Of Respondents |
|---|---|---|
| Western Europe | 457 | 62.18% |
| Asia Pacific | 83 | 11.29% |
| North America | 62 | 8.44% |
| Middle East & Africa | 46 | 6.26% |
| Eastern Europe & Central Asia | 44 | 5.99% |
| Latin America & The Caribbean | 16 | 2.18% |
| Other | 27 | 3.67% |
| **Total** | **735** | **100.00%** |

## Table 35 | Respondents By Engagement In Green Finance

### a. All Respondents

| Engagement In Green Finance | Number Of Respondents | Percentage Of Respondents |
|---|---|---|
| Working on Green Finance (All) | 399 | 54.29% |
| Interested in Green Finance | 289 | 39.32% |
| Other/Not Given | 47 | 6.39% |
| **Total** | **735** | **100.00%** |

### b. Recent Respondents (where we asked for respondents to identify whether full- or part-time)

| Engagement In Green Finance | Number Of Respondents | Percentage Of Respondents |
|---|---|---|
| Working Full-time On Green Finance | 83 | 24.56% |
| Working Part-time On Green Finance | 118 | 34.91% |
| Interested in Green Finance | 112 | 33.14% |
| Other/not given | 25 | 7.40% |
| **Total** | **338** | **100.00%** |

## Table 36 | Respondents By Size Of Organisation

| Size Of Organisation | Number Of Respondents | Percentage Of Respondents |
|---|---|---|
| <100 | 377 | 51.29% |
| 100-500 | 98 | 13.33% |
| 500-1000 | 30 | 4.08% |
| 1000-2000 | 36 | 4.90% |
| 2000-5000 | 46 | 6.26% |
| >5000 | 115 | 15.65% |
| Other/not given | 33 | 4.49% |
| Total | 735 | 100.00% |

## Table 38 | Respondents By Age

| Age Band | Number Of Respondents | Percentage Of Respondents |
|---|---|---|
| 18-30 | 142 | 19.32% |
| 30-45 | 232 | 31.56% |
| 45-60 | 243 | 33.06% |
| 60+ | 86 | 11.70% |
| Other/not given | 32 | 4.35% |
| Total | 735 | 100.00% |

## Table 37 | Respondents By Gender

| Gender | Number Of Respondents | Percentage Of Respondents |
|---|---|---|
| Female | 247 | 33.61% |
| Male | 456 | 62.04% |
| Other | 1 | 0.14% |
| Prefer not to say/not given | 31 | 4.22% |
| Total | 735 | 100.00% |

# Appendix 4: Methodology

The GGFI provides ratings for the depth and quality of the green finance offering of financial centres. The process involves taking two sets of ratings – one from survey respondents and one generated by a statistical model – and combining them into a single ranking.

For the first set of ratings, the **financial centre assessments**, respondents use an online questionnaire to rate the depth and quality of each financial centre's green finance offering, using a ten point scale ranging from little depth/very poor to mainstream/excellent.  Responses are sought from a range of individuals drawn from the financial services sector, non-governmental organisations, regulators, universities, and trade bodies.

For the second set of ratings, a support vector engine uses a database of indicators, or **Instrumental Factors**, that contains quantitative data about each financial centre, to predict how each respondent would have rated the financial centres they do not know.  These instrumental factors draw on data from 132 different sources covering sustainability, comprising green finance activities as well as the physical attributes of a centre, such as air quality and local carbon emissions; business, including legal and policy factors and statistics on economic performance; human capital, reflecting educational development and social factors; and infrastructure, including telecommunications and public transport. A full list of the instrumental factors used in the model is in Appendix 5.

The respondents' actual ratings as well as their predicted ratings for the centres they did not rate, are then combined into a single table to produce the ranking.

**Factors Affecting The Inclusion Of Centres In The GGFI**

The questionnaire lists a total of 114 financial centres which can be rated by respondents.  The questionnaire also asks whether there are financial centres that will improve their green finance offering significantly over the next two to three years.  Centres which are not currently within the questionnaire and which receive a number of mentions in response to this question will be added to the questionnaire for future editions.

We give a financial centre a GGFI rating and ranking if it receives a statistically significant minimum number of assessments from individuals based in other geographical locations - at least 20 in GGFI 4. This means that not all 114 centres in the questionnaire receive a ranking.  We will keep this number under review for further editions of the index as the number of assessments increases.

We will also develop rules as successive indices are published as to when a centre may be removed from the rankings, for example, if over a 24 month period, a centre has not received a minimum number of assessments.

**Financial Centre Assessments**

Financial centre assessments are collected via an online questionnaire which will run continuously and which is at greenfinanceindex.net/survey/. A link to this questionnaire is emailed to a target list of respondents at regular intervals. Other interested parties can complete the questionnaire by following the link given in GGFI publications.

In calculating the GGFI:
• the score given by a respondent to their home centre, and scores from respondents who do not specify a home centre, are excluded from the model – this is designed to prevent home bias;
• financial centre assessments are included in the GGFI model for 24 months after they have been received – we consider that this is a period during which assessments maintain their validity; and
• financial centre assessments from the month when the GGFI is created will be given full weighting with earlier responses given a reduced weighting on a logarithmic scale as shown in Chart 58 - this recognises that older ratings, while still valid, are less likely to be up-to-date.

**Chart 58 |** **Reduction In Weighting As Assessments Get Older**
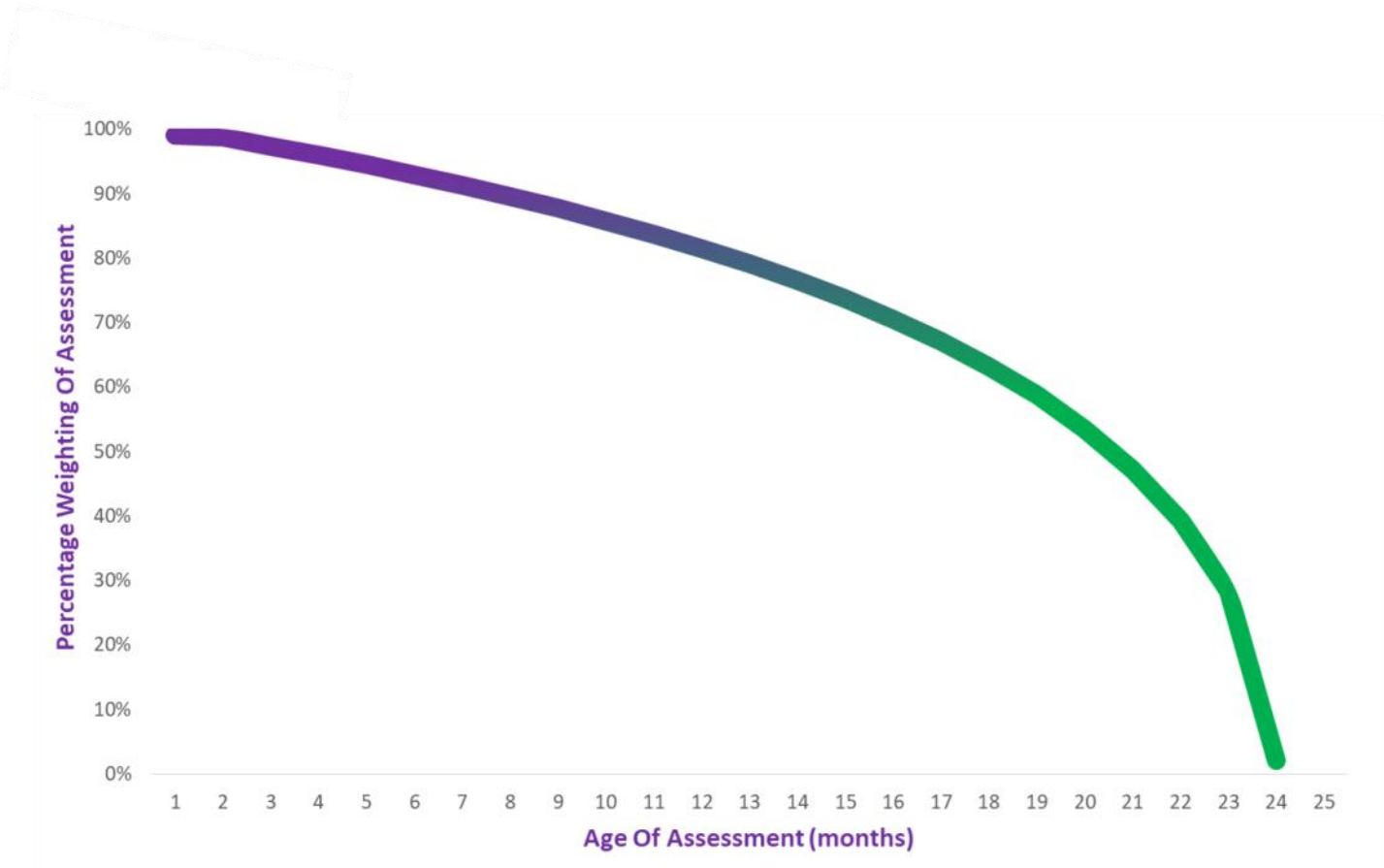
**Instrumental Factor Data**

For the instrumental factors, we have the following data requirements:
- data series should come from a reputable body and be derived by a sound methodology; and
- data series should be readily available (ideally in the public domain) and be regularly updated.

The rules on the use of instrumental factor data in the model are as follows:
- updates to the indices are collected and collated every six months;
- no weightings are applied to indices;
- indices are entered into the GGFI model as directly as possible, whether this is a rank, a derived score, a value, a distribution around a mean or a distribution around a benchmark;
- if a factor is at a national level, the score will be used for all centres in that country; nation-based factors will be avoided if financial centre (city)-based factors are available;
- if an index has multiple values for a city or nation, the most relevant value is used;
- if an index is at a regional level, the most relevant allocation of scores to each centre is made (and the method for judging relevance is noted); and
- if an index does not contain a value for a particular financial centre, a blank is entered against that centre (no average or mean is used).

**Factor Assessment**

Neither the financial centre assessments nor the instrumental factors on their own can provide a basis for the construction of the GGFI.

The financial centre assessments rate centres on their green finance performance, but each individual completing the questionnaire will:
- be familiar with only a limited number of centres - probably no more than 10 or 15 centres;
- rate a different group of centres making it difficult to compare data sets; and
- consider different aspects of centres' performance in their ratings.

The instrumental factors are based on a range of different models.  Using just these factors would require some system of totaling or averaging scores across instrumental factors.  Such an approach would involve a number of difficulties:
- Indices are published in a variety of different forms: an average or base point of 100 with scores above and below this; a simple ranking; actual values, e.g., $ per square foot of occupancy costs; or a composite 'score';
- Indices would have to be normalised, e.g., in some indices, a high score is positive while in others a low score is positive;
- Not all centres are included in all indices; and
- The indices would have to be weighted.

Given these issues, the GGFI uses a statistical model to combine the financial centre assessments and instrumental factors.

This is done by conducting an analysis to determine whether there is a correlation between the financial centre assessments and the instrumental factors we have collected about financial centres. This involves building a predictive model of the rating of centres' green financial offerings using a support vector machine (SVM).

The details of the methodology can be accessed at http://www.longfinance.net/programmes/the-global-green-finance-index/methodology.html. The statistical model is developed in R, an open source language and environment for statistical computing and graphics.

An SVM is a supervised learning model with associated learning algorithms that analyses data used for classification and regression analysis. SVMs are based upon statistical techniques that classify and model complex historic data in order to make predictions on new data. SVMs work well on discrete, categorical data but also handle continuous numerical or time series data.

The SVM used for the GGFI provides information about the confidence with which each specific rating is made and the likelihood of other possible ratings being made by the same respondent.

The model then predicts how respondents would have assessed centres with which they are unfamiliar, by answering questions such as:

> *If a respondent gives Singapore and Sydney certain assessments then, based on the instrumental factors for Singapore, Sydney, and Paris, how would that person assess Paris?*

> Or

> *If Edinburgh and Munich have been given a certain assessment by this respondent, then, based on the instrumental factors for Edinburgh, Munich, and Zürich, how would that person assess Zürich?*

Financial centre rating predictions from the SVM are re-combined with actual financial centre assessments to produce the GGFI – a set of ratings for financial centres' green finance performance.

The process of creating the GGFI is outlined in Chart 59 below.

**Chart 59 | The GGFI Process**



Completed questionnaires: each respondent rates only a proportion of the total number of financial centres

Questionnaire
8 financial centres rated

Questionnaire
5 financial centres rated

Questionnaire
7 financial centres rated

Questionnaire
14 financial centres rated

Questionnaire
10 financial centres rated

Machine learning algorithm looks for relationships between assessments and instrumental factors

100+ instrumental factors on sustainability, business, human capital and infrastructure collected for all financial centres

Instrumental factor

Instrumental factor

Instrumental factor

Instrumental factor

Instrumental factor

Instrumental factor

Instrumental factor

Instrumental factor

Machine learning algorithm assigns ratings to unrated centres for each individual questionnaire response, based on analysis of instrumental factor/assessment relationship

Complete assessments and predictions for all financial centres

Global Green Finance Index constructed/updated

# Appendix 5: Instrumental Factors

**Table 39 | Sustainability Instrumental Factor Correlation With Depth Ratings - Highest 15 Factors**

| Instrumental Factors | R-squared |
|---|---|
| Sustainable Cities Index | 0.508 |
| Water Quality | 0.481 |
| Quality of Living City Rankings | 0.455 |
| Environmental Performance Index | 0.433 |
| IESE cities in motion index | 0.427 |
| Financial centre corporate sustainability performance | 0.404 |
| Sustainable Economic Development | 0.392 |
| Quality of Life Index | 0.296 |
| Global Sustainable Competitiveness Index | 0.287 |
| Energy Sustainability Index | 0.232 |
| Air Quality Data | 0.197 |
| Shares of wind and solar in electricity production | 0.168 |
| Total number of labelled green bonds issued to December 2018 | 0.160 |
| Total issuance of labelled green bonds to December 2018, USDm | 0.147 |
| City Commitment To Carbon Reduction (Cooperative Action) | 0.102 |

**Table 40 | Sustainability Instrumental Factor Correlation With Quality Ratings - Highest 15 Factors**

| Instrumental Factors | R-squared |
|---|---|
| Quality of Living City Rankings | 0.563 |
| Environmental Performance Index | 0.551 |
| Sustainable Cities Index | 0.542 |
| Water Quality | 0.520 |
| IESE cities in motion index | 0.488 |
| Sustainable Economic Development | 0.449 |
| Financial centre corporate sustainability performance | 0.439 |
| Quality of Life Index | 0.350 |
| Global Sustainable Competitiveness Index | 0.303 |
| Energy Sustainability Index | 0.302 |
| Shares of wind and solar in electricity production | 0.300 |
| Air Quality Data | 0.240 |
| City Commitment To Carbon Reduction (Cooperative Action) | 0.160 |
| Total issuance of labelled green bonds to December 2018, USDm | 0.150 |
| Total number of labelled green bonds issued to December 2018 | 0.134 |

## Table 41 | Sustainability Factors

| Instrumental Factor | Source | Website | Updated |
|---|---|---|---|
| Air Quality Data | WHO | http://www.who.int/airpollution/data/cities/en/ | N |
| Average Precipitation In Depth (mm Per Year) | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators | N |
| Buildings Energy Efficiency Policies Database (Y/N) | IEA | https://www.iea.org/beep/ | Y |
| Certified Climate Bonds Issued To December 2018, % Of Centre Total | CBI | ttps://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| City Commitment To Carbon Reduction (Cooperative Action) | UNFCCC | http://climateaction.unfccc.int/views/stakeholders.html?type=cities | N |
| City Commitment To Carbon Reduction (Individual Action) | UNFCCC | http://climateaction.unfccc.int/views/stakeholders.html?type=cities | N |
| Climate-Aligned Bonds Outstanding by Country Of Issuer | CBI | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| CO2 Emissions Per Capita | World Bank | https://data.worldbank.org/indicator/EN.ATM.CO2E.PC | N |
| Energy Intensity Of GDP | Enerdata Statistical Yearbook | https://yearbook.enerdata.net/download/ | Y |
| Energy Sustainability Index | World Energy Council | https://www.worldenergy.org/publications/entry/world-energy-trilemma-index-2018 | N |
| Environmental Performance Index | Yale University | https://epi.envirocenter.yale.edu/epi-topline | N |
| Externally-Reviewed (excl CCB) Labelled Green Bonds Issued To December 2018, % of centre total | CBI | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Financial Centre Carbon Intensity | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Financial Centre Clean To Fossil-Fuel Related Revenue (Clean Revenue) | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Financial Centre Clean To Fossil-Fuel Related Revenue (Dirty Revenue) | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Financial Centre Corporate Sustainability Performance | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Financial Centre Sustainability Disclosure | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Financial Centres Green Alignment - Non-Regulatory Actors | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Financial Centres Green Alignment - Regulators And Stock Exchanges | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Forestry Area | World Bank | http://databank.worldbank.org/data/reports.aspx?source=2&series=AG.LND.FRST.ZS&country= | N |
| Global Sustainable Competitiveness Index | Solability | http://solability.com/the-global-sustainable-competitiveness-index/the-index | N |
| GRESB Green Real Estate And Infrastructure Investment Score | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| IESE Cities In Motion Index | IESE | http://citiesinmotion.iese.edu/indicecim/?lang=en | Y |
| Labelled Green Bonds Issued By Country Of Issuer | CBI | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Not-Externally-Reviewed Labelled Green Bonds Issued To December 2018, % of centre total | CBI | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Protected Land Area % Of Land Area | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=2&series=ER.LND.PTLD.ZS&country= | Y |
| Quality of Life Index | Numbeo | http://www.numbeo.com/quality-of-life/rankings.jsp | Y |

**Table 41  (continued) | Sustainability Factors**

| Instrumental Factor | Source | Website | Updated |
| --- | --- | --- | --- |
| Quality of Living City Rankings | Mercer | https://mobilityexchange.mercer.com/Insights/quality-of-living-rankings | Y |
| Ratio Climate-Aligned Bonds To Total Debt Securities By Issuer Location | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Ratio Labelled Green Bonds To Total Debt Securities By Issuer Location | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Share Of Renewables In Electricity Production | Enerdata Statistical Yearbook | https://yearbook.enerdata.net/download/ | Y |
| Shares Of Wind And Solar In Electricity Production | Enerdata Statistical Yearbook | https://yearbook.enerdata.net/download/ | Y |
| Stock Exchanges With A Green Bond Segment (Y/N) | CBI | https://www.climatebonds.net/green-bond-segments-stock-exchanges | Y |
| Sum Of GHG Emissions | Corporate Knights | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Sustainable Cities Index | Arcadis | https://www.arcadis.com/en/global/our-perspectives/sustainable-cities-index-2018/citizen-centric-cities/ | N |
| Sustainable Economic Development | Boston Consulting Group | https://www.bcg.com/en-gb/publications/2018/seda-striking-balance-between-well-being-growth.aspx | N |
| Sustainable Stock Exchanges (Y/N) | UN Sustainable Stock Exchange Initiative | http://www.sseinitiative.org/sse-partner-exchanges/list-of-partner-exchanges/ | Y |
| Total Issuance Of Labelled Green Bonds To December 2018, USDm | CBI | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Total Number Of Labelled Green Bonds Issued To December 2018 | CBI | https://www.finance-watch.org/publication/global-green-finance-index-3/ | N |
| Water Quality | OECD | https://stats.oecd.org/Index.aspx?DataSetCode=BLI | Y |

**Table 42 | Human Capital Factors**

| Instrumental Factor | Source | Website | Updated |
|---|---|---|---|
| Citizens Domestic Purchasing Power | UBS | https://www.ubs.com/microsites/prices-earnings/en/ | N |
| Corruption Perception Index | Transparency International | https://www.transparency.org/cpi2018 | Y |
| Cost of Living City Rankings | Mercer | https://mobilityexchange.mercer.com/Insights/cost-of-living-rankings | Y |
| Crime Index | Numbeo | http://www.numbeo.com/crime/rankings.jsp# | Y |
| Educational Attainment | OECD | https://stats.oecd.org/Index.aspx?DataSetCode=BLI | Y |
| Employees Working Very Long Hours | OECD | https://stats.oecd.org/Index.aspx?DataSetCode=BLI | Y |
| GDP Per Person Employed | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators | Y |
| Global Cities Index | AT Kearney | https://www.atkearney.com/global-cities/2019 | Y |
| Global Innovation Index | INSEAD | http://www.globalinnovationindex.org/content.aspx?page=GII-Home | N |
| Global Intellectual Property Index | Taylor Wessing | https://united-kingdom.taylorwessing.com/en/ip-index/reports | N |
| Global Peace Index | Institute for Economics & Peace | http://www.visionofhumanity.org/ | Y |
| Global Skills Index | Hays | http://www.hays-index.com/ | N |
| Global Terrorism Index | Institute for Economics & Peace | http://www.visionofhumanity.org/ | N |
| Good Country Index | Good Country Party | https://www.goodcountry.org/index/results | Y |
| Government Effectiveness | The World Bank | http://info.worldbank.org/governance/wgi/index.aspx#home | N |
| Graduates In Social Science, Business And Law (As % Of Total Graduates) | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=Education%20Statistics | Y |
| Gross Tertiary Graduation Ratio | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=Education%20Statistics | Y |
| Health Care Index | Numbeo | http://www.numbeo.com/health-care/rankings.jsp | Y |
| Homicide Rates | UN Office of Drugs & Crime | https://dataunodc.un.org/crime/ | N |
| Household Net Adjusted Disposable Income | OECD | https://stats.oecd.org/Index.aspx?DataSetCode=BLI | N |
| Household Net Financial Wealth | OECD | https://stats.oecd.org/Index.aspx?DataSetCode=BLI | Y |
| Human Development Index | UN Development Programme | http://hdr.undp.org/en/2018-update/download | Y |
| Human Freedom Index | Cato Institute | https://www.cato.org/human-freedom-index | N |
| ICT Development Index | United Nations | http://www.itu.int/net4/ITU-D/idi/2017/index.html | N |
| Individual Income Tax Rates | KPMG | https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/individual-income-tax-rates-table.html | N |

## Table 42 (continued) | Human Capital Factors

| Instrumental Factor | Source | Website | Updated |
|---|---|---|---|
| Innovation Cities Global Index | 2ThinkNow Innovation Cities | https://www.innovation-cities.com/innovation-cities-index-2018-global/ | Y |
| Legatum Prosperity Index | Legatum Institute | http://www.prosperity.com/#!/ranking | N |
| Life Expectancy | OECD | https://stats.oecd.org/Index.aspx?DataSetCode=BLI | Y |
| Linguistic Diversity | Ethnologue | http://www.ethnologue.com/statistics/country | Y |
| Lloyd's City Risk Index 2015-2025 | Lloyd's | https://cityriskindex.lloyds.com/about/ | Y |
| Number Of High Net Worth Individuals | Capgemini | https://www.worldwealthreport.com/ | Y |
| Number Of International Association Meetings | World Economic Forum | http://reports.weforum.org/travel-and-tourism-competitiveness-report-2017/ | Y |
| OECD Country Risk Classification | OECD | http://www.oecd.org/trade/topics/export-credits/documents/cre-crc-current-english.pdf | N |
| Open Data Barometer | World Wide Web Foundation | https://opendatabarometer.org/4thedition/?_year=2016&indicator=ODB | Y |
| Open Government | World Justice Project | http://worldjusticeproject.org/rule-of-law-index | N |
| Passport Index | Henley Partners | https://www.henleypassportindex.com/passport-index | Y |
| Personal Tax Rates | OECD | https://stats.oecd.org/index.aspx?DataSetCode=TABLE_I6 | Y |
| Political Stability And Absence Of Violence/Terrorism | The World Bank | http://info.worldbank.org/governance/wgi/index.aspx#home | N |
| Press Freedom Index | Reporters Without Borders (RSF) | https://rsf.org/en/ranking/2019 | Y |
| Prime International Residential Index | Knight Frank | http://www.knightfrank.com/wealthreport | Y |
| Regulatory Quality | The World Bank | http://info.worldbank.org/governance/wgi/index.aspx#home | N |
| Tax As Percentage Of GDP | The World Bank | https://data.worldbank.org/indicator/GC.TAX.TOTL.GD.ZS | Y |
| Top Tourism Destinations | Euromonitor | https://go.euromonitor.com/white-paper-travel-2018-100-cities.html | N |
| Wage Comparison Index | UBS | https://www.ubs.com/microsites/prices-earnings/en/ | N |
| World Talent Rankings | IMD | https://www.imd.org/wcc/world-competitiveness-center-rankings/talent-rankings-2018/ | N |

## Table 43 | Business Factors

| Instrumental Factor | Source | Website | Updated |
|---|---|---|---|
| Best Countries For Business | Forbes | http://www.forbes.com/best-countries-for-business/list/#tab:overall | N |
| Bilateral Tax Information Exchange Agreements | OECD | http://www.oecd.org/ctp/exchange-of-tax-information/taxinformationexchangeagreementstieas.htm | N |
| Broad Stock Index Levels | The World Federation of Stock Exchanges | http://www.world-exchanges.org/home/index.php/statistics/monthly-reports | Y |
| Business Environment Rankings | EIU | http://country.eiu.com/All | Y |
| Business Process Outsourcing Location Index | Cushman & Wakefield | http://www.cushmanwakefield.com/en/research-and-insight/2016/business-process-outsourcing-location-index-2016/ | N |
| Capitalisation Of Stock Exchanges | The World Federation of Stock Exchanges | http://www.world-exchanges.org/home/index.php/statistics/monthly-reports | Y |
| Common Law Countries | CIA | https://www.cia.gov/library/publications/the-world-factbook/fields/308.html | Y |
| Corporate Tax Rates | PWC | https://www.pwc.com/payingtaxes | Y |
| Democracy Index | The Economist | https://www.eiu.com/topic/democracy-index | New |
| Domestic Credit Provided By Banking Sector (% Of GDP) | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators | Y |
| Ease Of Doing Business Index | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=doing-business | N |
| Economic Performance Index | The Brookings Institution | https://www.brookings.edu/research/global-metro-monitor-2018/#rank | N |
| External Positions Of Central Banks As A Share Of GDP | The Bank for International Settlements | http://www.bis.org/statistics/annex_map.htm | Y |
| FDI Confidence Index | AT Kearney | https://www.atkearney.com/foreign-direct-investment-confidence-index | Y |
| FDI Inward Stock (In Million Dollars) | UNCTAD | http://unctad.org/en/Pages/DIAE/World%20Investment%20Report/Annex-Tables.aspx | Y |
| Financial Secrecy Index | Tax Justice Network | http://www.financialsecrecyindex.com/ | N |
| Foreign Direct Investment Inflows | UNCTAD | http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=96740 | N |
| Global Connectedness Index | DHL | www.logistics.dhl/gci | Y |
| Global Enabling Trade Report | World Economic Forum | https://www.weforum.org/focus/global-enabling-trade-report-2016 | N |
| Global Services Location | AT Kearney | https://www.atkearney.com/digital-transformation/gsli | Y |
| Government Debt As % Of GDP | CIA | https://www.cia.gov/library/publications/the-world-factbook/rankorder/2186rank.html | Y |
| Net External Positions Of Banks | The Bank For International Settlements | http://www.bis.org/statistics/annex_map.htm | Y |
| Office Occupancy Cost | CBRE Research | https://www.cbre.com/research-and-reports/Global-Prime-Office-Occupancy-Costs-2019 | Y |

## Table 43 (continued) | Business Factors

| Instrumental Factor | Source | Website | Updated |
|---|---|---|---|
| Open Budget Survey | International Budget Partnership | http://survey.internationalbudget.org/#download | N |
| Operational Risk Rating | EIU | http://www.viewswire.com/index.asp?layout=homePubTypeRK | Y |
| Percentage Of Firms Using Banks To Finance Investment | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators | Y |
| Real Interest Rate | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators | Y |
| Total Net Assets Of Regulated Open-End Funds | Investment Company Institute | http://www.icifactbook.org/ | Y |
| Value Of Bond Trading | The World Federation of Stock Exchanges | http://www.world-exchanges.org/home/index.php/statistics/monthly-reports | Y |
| Value Of Share Trading | The World Federation of Stock Exchanges | http://www.world-exchanges.org/home/index.php/statistics/monthly-reports | Y |
| Volume Of Share Trading | The World Federation of Stock Exchanges | http://www.world-exchanges.org/home/index.php/statistics/monthly-reports | Y |
| World Competitiveness Scoreboard | IMD | https://www.imd.org/wcc/world-competitiveness-center-rankings/world-competitiveness-ranking-2019/ | Y |

## Table 44 | Infrastructure Factors

| Instrumental Factor | Source | Website | Updated |
|---|---|---|---|
| Crude Oil Input To Refineries | Enerdata Statistical Yearbook | https://yearbook.enerdata.net/download/ | N |
| Global Competitiveness Index | World Economic Forum | http://reports.weforum.org/global-competitiveness-report-2018/competitiveness-rankings/ | N |
| INRIX Traffic Scorecard | INRIX | http://inrix.com/scorecard/ | Y |
| JLL Real Estate Transparency Index | Jones Lang LaSalle | http://greti.jll.com/greti/rankings | N |
| Liner Shipping Connectivity Index | The World Bank | http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators | N |
| Logistics Performance Index | The World Bank | http://lpi.worldbank.org/international/global | N |
| Metro Network Length | Metro Bits | http://mic-ro.com/metro/table.html | N |
| Networked Readiness Index | World Economic Forum | http://reports.weforum.org/global-information-technology-report-2016/ | N |
| Networked Society City Index | Ericsson | https://www.ericsson.com/res/docs/2016/2016-networked-society-city-index.pdf | N |
| Quality Of Domestic Transport Network | World Economic Forum | https://www.weforum.org/reports/the-travel-tourism-competitiveness-report-2017 | N |
| Quality Of Roads | World Economic Forum | https://www.weforum.org/reports/the-travel-tourism-competitiveness-report-2017 | N |
| Railways Per Land Area | CIA | https://www.cia.gov/library/publications/the-world-factbook/rankorder/2121rank.html | Y |
| Roadways Per Land Area | CIA | https://www.cia.gov/library/publications/the-world-factbook/rankorder/2085rank.html | Y |
| Telecommunication Infrastructure Index | United Nations | https://publicadministration.un.org/egovkb/en-us/Data-Center | N |
| TomTom Traffic Index | TomTom | https://www.tomtom.com/en_gb/trafficindex/list?citySize=LARGE&continent=ALL&country=ALL | N |

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القطب المالي للدار البيضاء

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**Manal Bernoussi at manal.bernoussi@cfca.ma**
**www.casablancafinancecity.com**

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Luxembourg for Finance (LFF) is the Agency for the Development of the Financial Centre. It is a public-private partnership between the Luxembourg Government and the Luxembourg Financial Industry Federation (PROFIL). Founded in 2008, its objective is to develop Luxembourg's financial services industry and identify new business opportunities.

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**lff@lff.lu**
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**Im Gukhyun gukhyun@seoul.go.kr /
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**Tolkyn Takishova at t.takishova@aifc.kz
www.aifc.kz**

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**IFSIreland@finance.gov.ie**

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**Daniel Wang at danielwang@globaltimes.com.cn
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Based in Shenzhen, Southern China, CDI has one hundred and sixty staff, with an affiliated network that consists of renowned experts from different fields.

**Carol Feng at carolf@cdi.org.cn**
**www.cdi.org.cn**

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**Dipesh Shah at dipesh.shah@giftgujarat.in**
**www.giftgujarat.in**

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