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THE ROLE BONDS IN FINANCING CLIMATE RESILIENT ECONOMY

Keywords: climate bond, environmental finance, low-carbon economy.

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Abstract: Climate bonds are a new category of climate-related financial products in environmental finance. The validity of the emergence of climate bond market seems reasonable to attract private capital to finance climate-resilient economy and to make the recognition of green investment easier for potential investors. Investments in low-carbon assets and technology to meet the Kyoto Protocol targets or investments to adopt to extreme weather conditions are just examples of sources of the capital needed. Developing the potential of green bond market has not been fully exploited so far. In the future, the most important determinants to stimulate the growth of the market will be green standardizations that are currently under construction. Positive outlook also results from existence of institutional investors represents tens of trillion USD and intends to incorporate climate change into investment strategies. Not without significance is the fact that green sukuk will enlarge the spectrum of climate-related financial products.

Translated by Marcelina Więckowska

ROLA OBLIGACJI W FINANSOWANIU GOSPODARKI ODPORNEJ NA ZMIANY KLIMATYCZNE

Słowa kluczowe: finansowanie ochrony środowiska, gospodarka niskoemisyjna, obligacje klimatyczne.

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Abstrakt: Obligacje klimatyczne są nową kategorią instrumentów finansowych powiązanych z finansowaniem ochrony środowiska naturalnego. Zasadność wyłonienia takiego segmentu rynku z jednej strony wynika z konieczności akceleracji inwestycji sektora prywatnego w celu finansowania gospodarki odpornej na zmiany klimatu, z drugiej strony daje możliwość szybszej identyfikacji zielonych inwestycji przez stronę popytową tego rynku. Inwestycje w technologie niskoemisyjne w celu sprostania wytycznym ustanowionym w Protokole z Kioto czy inwestycje dostosowawcze będące konsekwencją nasilających się ekstremalnych zjawisk pogodowych są jedynie przykładami źródeł potrzeb kapitałowych. Jak dotąd, potencjał rozwoju rynku zielonych obligacji nie został w pełni wykorzystany. W przyszłości najważniejszym bodźcem w rozwoju tego rynku będą obecnie tworzone zielone standardy emisji. Szansą dla rozwoju rynku zielonych obligacji jest także potencjał inwestorów instytucjonalnych (niejednokrotnie zrzeszonych w organizacjach klimatycznych) reprezentujących dziesiątki bilionów dolarów i chcących uwzględniać kwestie klimatyczne w strategiach inwestycyjnych. Nie bez znaczenia jest także poszerzenie spektrum instrumentów powiązanych z ochroną klimatu o zielone sukuk.

■■■ INTRODUCTION

Preventing environmental degradation is not only intergenerational obligation but also a factor that impacts doing business and even affects the quality of human live. Climate risk awareness and access to capital are fundamental issues to build low-carbon and climate resilient economy. Financial market provides some solutions in this area through the offer of climate change-related financial products such as green or climate bond.

The idea of using securities to finance environmental protection is not new (see Dziawgo 1997), but only in recent times there started separation of climate or green bond category on global scale. Standard definition of climate finance are currently under construction. “Green bond” and “climate bond” are the most commonly used designations for bonds that finance environmental protections and climate resilient economy. The Climate Bond Initiative (CBI 2011) working definitions focus on projects or assets that directly contribute to development of low carbon industries, technologies and practices to build low carbon economy. Definition also includes bond issuances to finance essential adaptation to the consequences of climate change. For the time being, definitions of green bond and climate bond essentially do not differ and purposes of the issuances are consistent. In the future, however there are expected greater segmentations of green debt market.

The purpose of this paper is to explain why emergence and extension of climate bond market is reasonable and systematize determinants of the mar-

ket development. Paper also describes main features and specific categories of green bonds.

1. RESEARCH METHODOLOGY AND RESEARCH PROCESS

The paper contains descriptive research studies. To achieve the objectives were analyzed reports and surveys conducted by financial and international research institutions. The analysis of green bond issuances allowed to systematizations this relatively new part of financial market. The observations process of financial market trends and logical connections cause and effect relationship, made it possible to conclude on the determinants of climate bond market development.

2. CLIMATE BOND AS A TOOL OF ECOLOGICAL RISK MANAGEMENT

Ecological risk has many dimensions and affects to a certain extent all people, businesses and economies. The effects of climate change and extreme events in nature are particularly acute for developing countries (disasters pose risks for agriculture, food, and water supplies). Green bond is a tool that engages capital to be invested into sustainable projects. The World Bank (International Bank for Reconstruction and Development) raises capital to help affected people to climate change. This securities help implementations of the Banks' statutory duties. The bank clearly defined ecological targets of bond issuance and coined a term of "green bond" (The World Bank 2012).

Not only the Word Bank Group, but also other multilateral development institutions helped to establish green bond market in 2007/2008 (but naturally single climate-theme bond issuance another issuers took place earlier). The European Investment Bank was precursor to financing tied to climate change solutions project. Since 2007 the EIB there have been launched Climate Awareness Bonds to support lending renewable energy and energy efficiency. Subsequently other multilateral development banks started to issue environmental bonds (the Nordic Investment Bank) or clean energy bonds (the African Investment Bank and the Asian Investment Bank) to highlight pro-environmental bond issuance targets.

Environmental issues are not completely inert for businesses. Research shows that companies are aware of potential risk from future climate changes but do not recon that their businesses are vulnerable to them. However compa-

nies perceive more risks from extreme weather events which increase physical risks to business operations. They are more interested in current climate variability rather than in the future climate change despite that the level of their awareness in both aspects is high. In this case interaction is very simple: the more uncertainties around climate impacts the more companies' investments are spent on adaptation (Agrawala et al. 2011).

However ecological risk management is not only voluntary process. Countries must reach some environmental goals in the field of greenhouse gas emissions. Requirements result from international provisions (initiated by the Kyoto Protocol). This resulted that increasing number of companies are subject to carbon market regulations. Investment in low carbon technology as well as possibility implementations of carbon offset policies cause the increase of capital requirements (Więckowska 2013). Moreover worth noting that climate policy also affects return on investment in renewable energy sector.

Transformations to low carbon economy will require enormous investments. Today in order to decarbonize the world's energy system the amount of 1 trillion USD is invested annually. Additional trillion per year is needed. The cumulative investment in green growth should reach the amount of 36–42 trillion USD between 2012 and 2030 (Kaminker, Stewart 2012: 7).

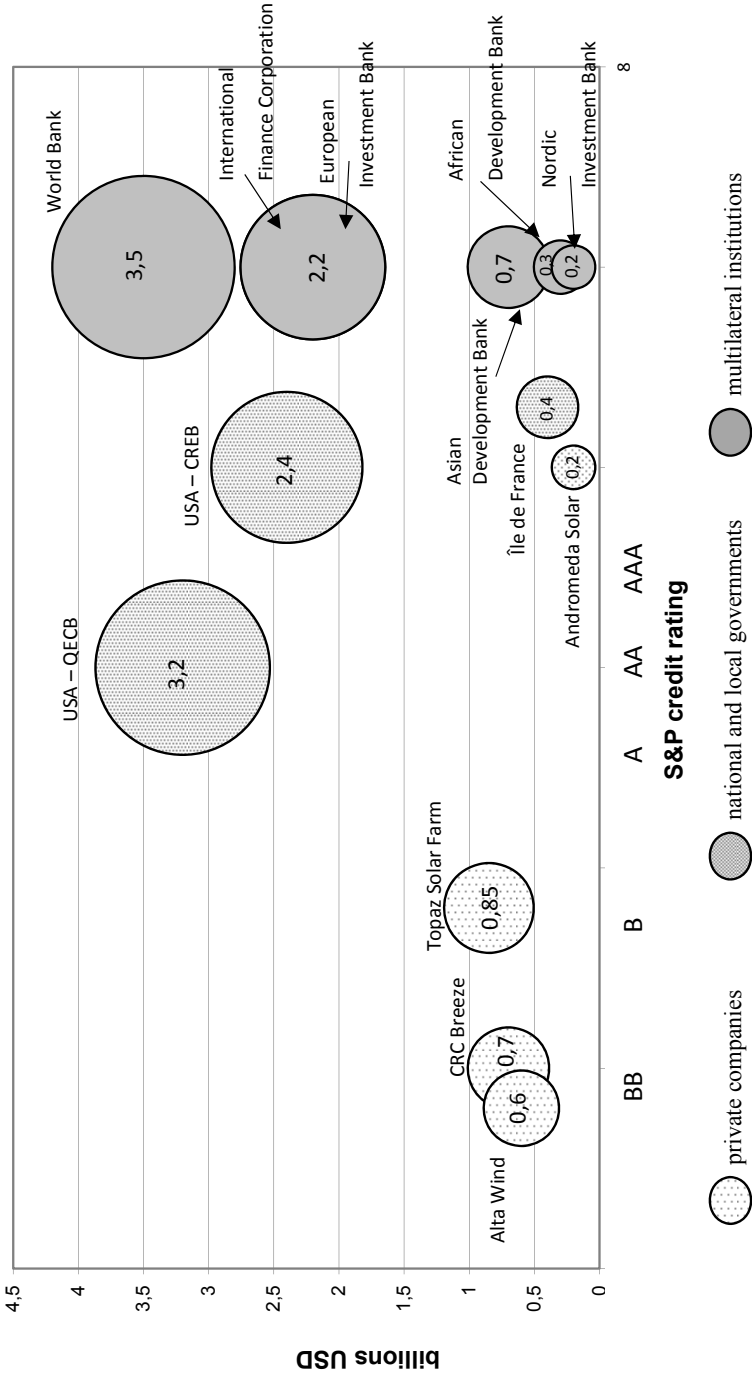
Bond market is becoming more and more attractive as a source of financing renewable energy project. However the business is still very risky and uncertain. Interesting example of green debt is issuance of financing photovoltaic power project in California. Topaz Solar Farm offered bond for 850 million USD. Demand shows that this kind of investment may be very attractive to investors. The oversubscribed was more than 400 million USD. The securities obtain only BBB-rating, but it was the largest issuance for a renewable-energy project without a U.S. government guarantee. MidAmerican Energy Holdings Co is planning more issuance of solar bonds (Doom, Buhayar 2012).

3. KEY CHARACTERISTICS OF THE CLIMATE BONDS MARKET

Chart 1 show the most important climate bond issuers. Analysis of the bond supply allow describing first characteristic of the market. Climate bonds financing green growth projects are generally related to:

- renewable energy (e.g. breeze bond, solar bond or broader: clean energy bond),

Chart 1. Major green bond issuers since 2006



Source : Croce et al. 2011: 39 (update based on website selected institutions).

- energy efficiency projects (transport efficiency, building efficiency, industrial efficiency),
- projects that reduce greenhouse gas emissions (e.g. low carbon technologies),
- waste management,
- project that help countries adapt to effects of climate change (e.g. flood protections or reforestations).

According to chart 1, all issuances of the multilateral development institutions have the highest credit quality. Green bond with triple-A rating denote exposure to green investment without project risk. Since 2008 the World Bank has issued green bonds of total value of 3,5 billion USD through 55 transactions in 17 currencies. But latest issuance of the International Finance Corporations (IFC – total 2,2 billion USD) corresponding to the amount of 1 billion USD is the largest green bond issued to this date. The IFC is also a member of the World Bank Group however is focused exclusively on the private sector.

Most of green bonds have the plain vanilla profile but there are also structured or covered bonds which become more and more popular. *Europe 2020 Project Bond Initiative* carried by the European Investment Bank is an example. The idea of this new initiative is to attract private capital by providing credit enhancement to project companies and improve credit quality of the bonds. In this case the EIB support investment involves inter alia transport and energy sector. However basic instruments of expansion to sustainable energy efficiency project applied by the EIB are still in Climate Awareness Bonds program. Since 2007 the European Investment Bank through climate bond has raised over 1,7 billion EUR (about 2,2 billion USD) equivalent.

Bonds supported by government incentives are another class of climate bonds. The bigger bond issuance was driven by US government programs *Qualified Energy Conservation Bonds (QECB)* and *Clean Renewable Energy Bonds (CREB)*. QECBs may be issued by state, local and tribal governments. Examples of qualified energy project include: investment in public buildings, green communities, renewable energy production or even energy efficiency educational campaigns. CREBs may be issued by public power utilities, electric cooperatives, government entities (states, cities) to finance renewable energy projects. QECBs and CREBs were initially constructed as tax credit bonds. But in march 2010 rules were changed from tax credit bonds to direct subsidy bonds.

Green bonds can be also asset backed securities (ABS). This type of debt is tied to specific green projects. For example CRC Breeze II bonds based on secu-

ritization were issued by a hedge fund through a Special Purpose Vehicle. This type of bonds is important innovation but very risky – returns depend largely on wind blows. In 2010 due to low wind levels over the past four years breeze bonds were downgraded (Croce et al. 2011: 49).

In 2008 financial market participations started to create more sophisticated green structured product. The first synthetic green bonds (called the Environment Optimizer/Top Green Bond 1) were offered by Société Générale. This product was linked to the performance of the Lyxor Dynamic Environment Fund, which offered exposure to the SGI Global Environment Index. Investors in the worst case received nominal return of 0% (get back face value), but also maximum return was capped at 8% (Croce et al. 2011: 48). Global financial crisis interrupted development of trend of green structured finance.

To sum up, the typical categories of climate bonds include (see also Inderst et al. 2012: 28):

- bonds issued by multilateral development institutions (IBRD, EIB, IFC etc.),
- corporate bonds (issued by a green company),
- sovereign or municipal bonds (e.g. CREBs, Île de France),
- asset backed (tied to specific green project).

At this point, analysis should be completed about bond issuances by banks defined as ecological. This kind of bank works as typically commercial bank but specializes in financing pro-ecological economic undertakings. The eco-banks connect ecological and economic criteria in making investment decisions. There are not many institutions of this kind. The Bank Ochrony Środowiska SA in Poland and UmweltBank AG in Germany are examples (Dziawgo 2003: 72–81).

4. THE STATE OF THE CLIMATE BOND MARKET IN 2012

First estimations about outstanding global climate-theme bond issuances were conducted for HSBC and the Climate Bond Initiative (see Robins, Knight 2012). Research disclosed size and structure of climate bond market. Outstanding value of climate bond was estimated for 174 billion USD (from 207 issuers, comprising over 1000 bonds). 82% of total issuance constituted corporate issuers, 13% from development banks and financial institutions, 3% concerned project bonds and 2% municipal bonds. Table 1 shows precise structure of the climate bond market by low-carbon sectors.

According to presented data, dominate issuance (119 billion USD) constituted bond finance low-carbon transport (notably rail). Moreover, the issuance

of Eurofima (which is rail financing institution) reached further 15 billion USD. Geographically, largest source of outstanding bonds came from Europe (67% of the global market). UK institutions have issued 23% climate bond, France 17% of the total. USA climate bond market constituted also 17%. In turn Russia, Canada and China all at 3% each.

The amount of 175 billion concerns fully-aligned climate bond issuance. This means that issuers are 100% exposed to climate themes. Authors of the study introduce additional classifications. If revenue exposure is more than 50% bonds are classified as strongly-aligned while those between 10–50% are weakly-aligned. HSBC and CBI estimated that further 210 billion USD are strongly-aligned. In addition, there have been identified 369 billion USD of conditionally-aligned bond. These issuances come from sectors or technologies that are important to the climate economy (including biofuels, hydro, waste and water), but issuers have not revealed information for classifications bond as climate-theme. This mean, that extra-financial disclosure and reporting referred to environmental effect still has not become common practice.

Table 1. The global climate-themed bond universe by theme 2012

Specification	Size of issuance		Details
	bn USD	%	
Transport	120,6	68,6%	119 bn USD linked to low carbon transport modes, vehicles, technologies and fuels
Energy	29,4	12,7%	29 bn USD linked to low carbon energy: wind (38%), solar (28%), hydro (21%)
Finance	22,4	12,7%	7,2 bn USD from multilateral development banks, 15 bn USD from Eurofima
Buildings and Industry	1,5	0,9%	energy efficiency of buildings and industry (including QECB)
Waste and Pollution Control	1,2	0,7%	recycling services or recycled products
Agriculture and Forestry	0,7	0,4%	sustainable paper and wood manufacturers, forest management companies

Sources: Bloomberg, Climate Bond Initiative, HSBC; Robins, Knight 2012.

Presented estimations show that climate bond segment is very small comparing to global bond market (21 trillion USD according to BIS data). What is more, according to OECD survey the bonds are dominant assets class in portfolio of institutional investors in most countries (see Kaminker, Stewart

2012: 34). Climate bond market is young, but opportunities to develop the market are not fully exploited.

5. DEVELOPMENT OF THE CLIMATE BOND MARKET

The determinants of development of climate bond market can be divided into following group:

- climate bond supply factors (connected with issuers),
- climate bond demand factors (connected with investors),
- regulatory and institutional determinants of market development,
- factors associated with risk of ecological investment,
- factors related to the standardizations and functioning of the market.

Determinant of increasing climate bonds market brought about new multilateral development institutions which support sustainable development. The United Kingdom formed the Green Investment Bank in 2012 to speed up the transition to green economy. Australia in turn established the Clean Energy Finance Corporation. These institutions are potential green bond issuers. Another issue increasing climate bond market is perspective of some kind of industry, for example clean energy. Finance renewable energy through green debt issuance becomes more important. An example of that is bond issuance by Topaz Solar Farm (project MidAmerican Energy Holdings Co controlled by Berkshire Hathaway). Huge potential lies also in issuance of corporates and municipalities. Raise capital by climate bond issuance to finance pro-ecological undertakings may entail positive effect is financial results (remain competitive, cost saving).

From the institutional investor's point of view, investment in green bond contribute to implementations of ESG (environmental, social and governance) policy. Especially some institutions (such as assets management company or ecological investment funds) are profiled in the ecological and ethical investments. The insurance industry has also created *Principles for Sustainable Insurance* (UNEP FI 2012). Interest of institutional investor exposed to green investment is noticeable. Institutional investors from all continents have formed groups to represent their interests e.g. the Institutional Investors Group on Climate Change or the Investor Network on Climate Risk (Kaminker, Stewart 2012: 19). Furthermore, sovereign wealth funds and pensions funds from some countries (e.g. Norway, Sweden, New Zealand) are obliged by law to ecological and ethical investments (Richardson 2011). Also for individual investors

(which becomes more and more aware of ecological risk) green bonds are perfect way for Social Responsible Investing. These are the steps leading in the right directions.

Predictable and stable regulations and policy support are key factors to rise climate bond market. The best proof of that is *Global Investors Statement on Climate Change* (2011) supported by 285 investors that represent 20 trillion USD asset under management. In the statements investors postulate comprehensive and transparent policies with clear objective and targets to provide appropriate incentives to invest. An important example of regulatory incentives is *feed-in tariffs*. Many climate bond issuers based business on this policy mechanism (e.g. Andromeda Solar, CRC Breeze Finance). Another instance of eligible regulatory policy are tax incentives (e.g. to create tax credit bonds) or credit enhancement tools (e.g. to create covered bonds). Finally, corporates can adapt for government climate policy in the field of emission reduction and renewable energy. It requires capital for low-carbon investments.

Regulatory uncertainty and political unpredictability are not the only risks associated with green infrastructure. The risk profile mostly depends on constructions of climate bond. The risk associated with bond market include inter alia: price risk, interest rate risk, credit risk, currency risk. In this case worth nothing, that green bond market still is too small for institutional investor. Scarcity and not very large issuance cause low liquidity and high transaction costs. In turn, risk resulting from the nature of project funding include high technological and operational risk. Barriers to the development of climate bond markets are lack of quality data which makes it difficult to assess the risk green investment and correlation with investment from other sectors. Lack of expertise and track records in new technologies also cause some problems. Specific risks related to clean energy projects (particular concern for securitisation of clean energy assets such as onshore wind and solar plants) is volumetric risk. This kind of risk is tied to productions volatility and, in fact depends on weather conditions. (Kaminker, Stewart 2012: 31–44). And finally, it should be noted that, important issue is also investors' confidence that their money in practice contributes to low-carbon economy.

Last group of factors of green bond market development are connected with standardizations and functioning of the market. It is worth recalling that the green bond concept was developed in 2007/2008. Institutions cooperating with the World Bank in this area is Nordic bank SEB (Skandinaviska Enskilda Banken). SEB started to create green bond market as a response to increased

investor demand for climate-related fixed income product. This was the beginning of market sharing of climate bond categories. Now the SEB's mission is "to make the green bond available across the credit and yield curves with various types of issuers (supranationals, corporates, governments) and risk class". These are a promising forecast to develop green bond market.

The Climate Bond Initiative (CBI) is another important organization contributing to growing climate bond market. The organizations promoting investment that will contribute to build low-carbon economy. CBI is currently developing the *Climate Bond International Standards and Certification Scheme*. The *Certification Scheme* allows investors to recognize low-carbon investments with confidence that their funds are being used to finance ecological undertakings. The *Certification Scheme* will include mechanisms for verification and monitoring of standard compliance. Moreover, process of verifications "greenness" of the bond will be support appropriate standard in terms of accounting and reporting. The *Climate Bond International Standards* is not financial but environmental standarization for bond' issuer to encourage investors to increase their exposure to green projects.

6. GREEN SUKUK UNDER THE CLIMATE BOND STANDARD

Interesting part of the global financial market constitute Islamic finance. In 2012 there arose the concept of eco-friendly Islamic securities such as green sukuk. In order to implement the idea, the Climate Bonds Initiative, the Clean Energy Business Council of the Middle East and North Africa and The Gulf Bond & Sukuk Association established Green Sukuk Working Group. Experts will promote best practices of issuance of sukuku for financing climate resilient economy (Kidney 2012).

Sukuku are Shari`ah compliant investments to give right to receive a share of profits generated by an underlying asset base. This financial products are commonly known as Islamic bonds and may have a form of interest-bearing investment certificates or fixed income securities (DIFC 2009). Sukuku conform to Islam's prohibition of usury and raised money cannot be invested in alcohol, gambling, tobacco, weapons or pork (OnIslam & Newspapers 2012). Climate Bond Standards additionally will profile this instruments as environment friendly.

Green sukuk should be used to finance growing number of projects, for example renewable energy in the Middle East. There is also urgent need to attract

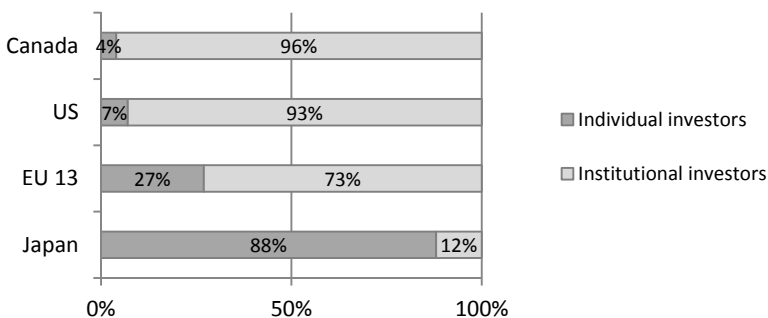
finance in developing Muslim countries such as Bangladesh and Pakistan. On the other hand the Climate Bond Standard will help investors identify Shari'ah compliant low-carbon investment (Kidney 2012).

Ethical nature of Islamic finance and growing number of SRI investor suggest using sukuk as a development tool. In this context, it is worth to mention that in 2005 the World Bank issued first (so far the only one) sukuk (200 million USD) in Malaysia market. Similarly International Finance Corporations issued sukuk (500 million RM) in Malaysia and in 2009 issued sukuk (100 million USD) that was listed on Nasdaq Dubai and the Bahrain Stock Exchange (Bennett, Iqbal 2011).

7. GREEN URIDASHI BONDS AS AN EXAMPLE OF RETAIL MARKET INVESTORS

Alongside with institutional investors the huge potential is involved in individual investors to finance low carbon economy. In the field of green bond issuance, the retail Japanese market seems to be particularly attractive. Chart 2 illustrates that individual investors decide about investment directions of the Japanese funds. Daiwa Securities estimates that in 2009 total financial assets in the Japanese household reached 15,5 billion USD (in comparison, in UK and Germany about 6,7 billion USD and France 5,4 billion USD).

Chart 2. Comparison the structure of savings by region in 2009



Source: Daiwa Securities 2010.

Eurobond issuance directed to retail Japanese investors and denominated in foreign currency are called "uridashi". So far, green bonds designed for

the Japanese investors have been issued mostly by the multilateral development institutions. First the World Bank green uridashi bond was issued in 2010 (150 million NZD). In turn the European Investment Bank issued Climate Awareness Bonds in Japan denominated in Australian dollars and South African rand (these two tranches was worth around 300 million EUR equivalent). The Nordic Investment Bank and the African Development Bank also recognized the potential of uridashi market.

Nikko Asset management through SMBC Nikko World Bank Green Bond Fund (SMBC is the Japanese distributor) raised 624 million USD from the Japanese market. This green credentials investment fund approximately 80 per cent invested in the World Bank green bond (Boyde 2012). Disparity in global interest rates and substantial savings of Japanese retail investors caused that uridashi bonds are an example of curious category in green bond market.

■■■ CONCLUSIONS

Engaging a private sector investment is necessary to climate-resilient future. Huge capital of institutional investors connected with fixed income products preferences are promising (but insufficient) determinants of climate bond market development. Growing interest of the climate and environmental issues cause that more and more institutions want to offer environment related financial products or recognize themselves as eco-friendly and socially responsible through investments by the ESG rules. Green bond is the way to green involvement for institutions which by the regulatory restrictions cannot have direct exposure to green investment.

Multilateral development institutions played a positive role in the establishment of green bond market. These institutions also contribute to create covered bond by providing credit enhancement to project companies. Whereas the governments support the private sector in raising capital can use tax credit bonds or direct subsidy bonds. However optimal leverage mechanism to support green investment should be the subject of further research.

At this moment climate bond market requires standards of verifying “greenness”. This conceptions are also of interest of representatives of Islamic finance. Standardizations and specifications may be crucial solutions to growing climate bond market and its selected segments. And finally, it should be kept in mind that eco-friendly securities though laudable purpose of issuance still remain financial instruments connected with multidimensional financial risk.

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