United Nations
Department of Economics and Social Affairs
Demand for Long Term Financing for Sustainable Development
Note for G20

The sustainable development agenda underscores the need for integrating economic development, social development and environmental protection. The need for long-term finance arises across all of these pillars, with significant synergies between expenditures on all three, particularly in the long run. The requirements for long term financing ultimately have to be examined in this context.

The United Nations has launched a broad based multi-stakeholder consultation to develop a Post-2015 development agenda on the heels of conclusion of the Millennium Development Goals (MDGs). As a part of the Rio+20 follow-up, Member States have agreed to mobilize an intergovernmental debate and work program to examine the broader issue of an effective sustainable development financing strategy. The present diagnostic work of the G20 will also serve as a critical input into this process.

In conjunction with the other notes of the G20 Long Term Financing project, this note focuses exclusively on recent trends in the sources of demand for long-term financing for sustainable development, emphasizing the third pillar of environmental sustainability. The note is divided into three sections. The first lays out projected financing needs and recent trends, particularly for low-carbon investments. The second presents a discussion of how these needs have altered not just the quantity of financing needed, but also the type of financing demanded. The final section looks at changes in the investment environment, including regulatory and financial measures to incentivize such financing.

Trends in demand for long-term financing

Projected Demand

Calculating how much financing is needed to achieve the three pillars of sustainable development is a complex task. Several studies focused on individual elements of sustainable development, such as estimates of investment needed to achieve the MDGs (calculated at around $120–$160 per capita through 2015).[1] More recently, there has been a proliferation of studies on required investment levels to achieve environmental sustainability.

At the outset it is important to recognize that estimates of demand from different sources vary widely, depending on the assumptions and scope of the studies. This note focuses on projections that have a broad scope, in an attempt to incorporate spillovers across the pillars of sustainability. Within the context of this note, it is estimated that the demand for incremental financing for low-carbon energy investments through 2050 is around $1 trillion per year (see Table 1) with projections for energy end-use (e.g. appliances) at $800 billion, and for adaptation at around $105 billion. In addition, projections for a 'business-as-usual' baseline scenario (which includes both high and low-carbon energy investments) are around $1.4 trillion per year. In addition, investment requirements for achieving the objective of maintaining calorie intake to counteract the potential decline in yields due to climate change is estimated to be about $7 billion per year.[2] The United Nations Environment Programme (2011) makes another set of scenario choices and

[1] MDG Gap Report, 2012.
[2] The United Nations World Economic and Social Survey: *The Great Green Technological Transformation,* 2011

proposes an investment requirement estimate of about 2 per cent of World Gross Product (WGP) from 2010 to 2050 (in level terms, this would amount to $1.3 trillion in 2010 dollars per year). Another set of estimates, from the International Energy Agency (IEA), projects a somewhat lower number, at $750 billion per year for both the baseline scenario plus new investments, increasing to $1.6 trillion a year from 2030-2050 to achieve stabilization at 450 ppmv CO2-equivalent by 2050.

Estimates across these studies are not strictly comparable, as the underlying model-based scenarios tend to differ. Differences in projections are dependent on assumptions regarding population and economic growth, technological developments, policy regimes, the continuum between climate change adaptation, mitigation, and disaster risk prevention, and different target objectives (for example, 550 versus 450 ppmv CO2 atmospheric concentration). In addition, sector coverage and breadth can account for other differences in projections. The central estimate presented in Table 1 includes related sector investments necessary to achieve sustainable development, such as the cost of construction of transportation infrastructure needed to install wind farms in remote areas. In contrast, the IEA projection is based on an engineering supply model, which does not include related infrastructure investments.

Another important issue in some projections is the valuation of future cash flows. For example, environmental damage worth $100 half a century from now would be valued at $49.90 using a discount rate of 1.4% a year (see the Stern report[3]) but only $5.43 or $6.88 using higher rates of 6 and 5.5%, respectively. Using a high discount rate significantly reduces the social profitability of taking mitigation actions today, reducing the attractiveness of investing today to benefit the welfare of future generations.

[3] Stern, Nicholas (2007). *Stern Review: The Economics of Climate Change*. Cambridge, United Kingdom: Cambridge University Press.

Table 1: Estimates of Required Investment Levels for Sustainable Development (US$ billion/year from 2000-2050)

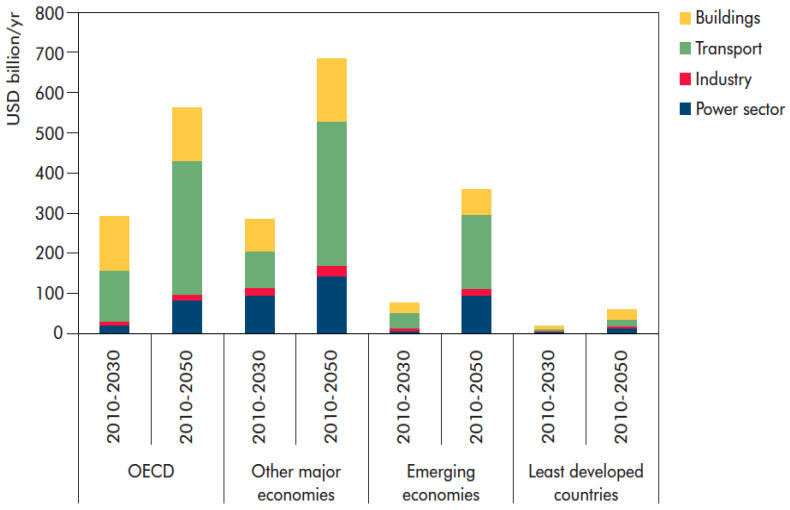
Sectors/themes	Time frame	Range of estimates	Mitigation		Adaptation
			Energy supply	**Energy end-use (appliances, etc.)**	
Assumed goals			*Stabilize GHG concentrations to limit warming to <2C (with at least 50%)*	*Significant end-use efficiency increase and GHG stabilization to <2C*	*Minimum investments into securing livelihoods, assuming successful mitigation*
***Incremental* investment requirements**	**Annual, 2000-2050, in billion 2010 US$**	**Range**	400 - 1600	n.a.	50 - 160
		Central estimate	**1000**	**800**	**105**
		Estimates from other sources	340 - 1360 (IPCC). 465 (Riahi et al., 2011)	**125 - 1400** (UN DESA estimates based on Wilson and Grubler, 2010)	
Comments			*Energy supply only. Investment needs in end-use appliances are several times this amount.*	*Energy end-use appliances (not just energy components)*	*These numbers assume stabilization of GHG concentrations below 450 ppmv. Without mitigation, adaptation needs might be 10-100 times as large.*
Investment needs for a BAU scenario	**Annual, 2000-2050, in billion US$**	**Central estimate**	**1400**	**1000**	**n.a.**
		Estimates from other sources	1200 (Rao and van Vuuren, 2009)	**380 - 4200 (DESA estimates based on Wilson and Grubler, 2010)**	
			870 (IEA, 2008)		

Source: United Nations World Economic and Social Survey: The Great Green Technological Transformation, 2011.

The projections in Table 1 incorporate investment demand in developed and developing countries. Investment in developing countries is focused on new systems, while investment in developed countries is focused on the replacement and transformation of existing capital. More than 50 per cent of the projected investment demand in the central estimate in Table 1 is expected to be generated in developing countries. The high percentage of demand in developing countries is partially based on the related investments in infrastructure, as discussed above.

Figure 1 shows a breakdown by sector and level of development, based on the 2010 IEA more targeted projections. As shown in the figure, the largest sources of demand will come from transport, followed by buildings and power generation. However, it should be noted that in the IEA framework, the majority of investment needs would be in the OECD and other major economies.

Figure 1: Additional investment needs in energy by sector and level of development (US$ billion/year, in 2007 dollars)



Source: IEA, Energy Technology Perspectives (2010), p537.

Despite differences in methodologies, it is clear that demand for new financing is enormous, and is expected to increase substantially over the next decades. Nonetheless, to date, only limited investments have gone into low-carbon investments. For example, the proportion of power generated by renewable energy, excluding large hydro, remains small, at only 6 per cent in 2011. Although global investment in renewable power and fuels increased by 17 per cent, to reach $257.5 billion in 2011, the growth of investment is still significantly below pre-financial crisis trends, which tended to be between 38 and 59 per cent annually. Investment in solar was hit relatively hard during the crisis, but has recovered since. Investments in wind energy only slowed moderately down by the crisis, but experienced a 12 per cent decline in 2011, due to changes in regulatory structures in some developed countries as discussed below.

While the overall investment in renewable energy continues to increase, the share of developing countries fell from 37 per cent in 2010 to 35 per cent in 2011. China and most other developing economies showed a sharp slowdown in renewable energy investment in 2011, though India remained a notable exception with a growth rate of 62%. While developed economies have continuously strengthened their share of investment in renewable energy, their strong performance in recent years appears to be caused by a jump

in US asset finance and a boom in small-scale solar PV in Italy and Germany. These developments may be short-lived, however, as they both depend on temporary subsidy programmes.[4]

Shifts in demand for financing

As the above discussion makes clear, investment in environmental sustainability comprises a wide array of sectors, including housing, energy, and transport in both developed and developing countries. Investment in sustainable development more broadly would include additional sectors, such as health, education, telecoms, etc. Each of these sectors has unique investment needs, projected cash flows, and risks. For example, investments in energy efficiency projects in the building sector are often made by small users, and are generally financed through credit. These projects typically pay for themselves within a relatively short period of time through cost savings, but tend to have high transaction costs and be unattractive for large investors. Mechanisms that aggregate many small users or projects so that they become investable propositions for large-scale investors would help garner financing in this area.

In contrast, infrastructure investments tend to have high up front capital costs and long 'pay-back' periods. Financing for these projects is generally a form of 'project finance' with a mixture of equity and debt, often through syndicated loans. Infrastructure projects generally have very long life-cycles, so that time horizons for these investments generally need to be of at least 15 to 20 years. Thus there is an ever increasing need for large sized investments and long-term financing. In addition, low-carbon investments often incorporate new or emerging technologies, requiring investors willing to take high risks, such as venture financing, often in conjunction with government support.

Key barriers to investment

The long time frame necessary for many types of infrastructure investments is outside the investment parameters of many investors, even for those considered to be 'long-term investors.' For example, the liability structure of longer-term institutional investors, such as defined benefits pension plans and life-insurers, averages around 10-15 years, while the actual duration of their portfolios is generally much shorter[5] due to the risk return tradeoffs of many long-term investments vs. other opportunities, as well as incentives based on annual performance and principal/agent issues. The financial crisis has further shortened the investment horizon of many investors. During the crisis, many institutional investors experienced difficulty refinancing liabilities, which led them to reassess the extent to which they should undertake long-term illiquid investments.[6] The recent crisis also revealed that banks had mismanaged their liquidity positions, resulting in a significant deleveraging of the banking system and a reduction in credit. Basel III, which imposes higher capital charges for riskier investments, could further reduce the availability of long-term financing, particularly long-term infrastructure investments.[7] In addition, local capital markets in many developing countries have a short-term bias, so that many countries continue to have difficulty financing long-term needs associated with necessary investments in sustainable development domestically.

While the issue of a long investment horizon arises with traditional infrastructure investment, it is particularly relevant for low-carbon infrastructure projects, due to higher risks and lower expected returns over the life of the project. Financing for projects is raised on the basis of the future income stream. Yet, to date, renewable energy investments have not yet yielded high returns. Capital costs on low-carbon

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4 FS-UNEP-Centre (2012), Global Trends in Renewable Energy Investment 2012.

5 The World Economic Forum, *"The future of long-term investing" See* http://www3.weforum.org/docs/WEF_FutureLongTermInvesting_Report_2011.pdf.

6 United Nations World Economic Situation and Prospects, 2013.

7 Ibid

infrastructure projects are often higher than for alternative investments opportunities, while future cash flows are more uncertain due to the technology – as output depends on natural resources, which can be unpredictable – as well as to uncertainty surrounding market formation and the regulatory environment.

Financing is also needed for new and emerging technologies, which carry high risks that are often difficult to measure and price. New technologies generally have high operating expenses and are often less reliable in the early stages of development. This is true of most green technologies, even those like wind and solar PV that have longer histories.[8] There are also path dependencies associated with existing carbon technologies that are difficult for new technologies to overcome, even when the new technologies are potentially superior. For example, existing technologies have large sunk costs in infrastructure, which constrain their replacement.

Many of the technologies currently in use also have large environmental externalities and other social costs that are not factored into market prices. Furthermore, price distortions, such as subsidies for fossil fuels, impact the competitiveness of renewable energy investments. As a result, markets for new low-carbon products do not automatically develop once products are diffused. The viability of these projects is often dependent on the maintenance of policy support, though there is often mismatch between the life-cycle of many low carbon infrastructure investments and a shorter time frame that is often perceived to be associated with government policies. In addition, such investment requires expertise that many investors do not have.

In response, governments in many countries have taken steps to incentivize investment in low-carbon investments. There are three categories of support, which target both price and quantity. The first group attempts to effectively price high-carbon technologies through cap and trade schemes and carbon taxes. The second lowers the cost and/or risk associated with low-carbon technologies through subsidies or guaranteed premium payments for energy inputs, such as feed-in tariffs (FITs) or other risk-sharing mechanisms such as public-private partnerships (PPPs). The third helps to build market demand by setting quantity targets through regulations, or creating demand through government procurement or other programs.

Impact on the environment of investment financing

Carbon pricing

Carbon pricing policies such as cap-and-trade schemes and carbon taxes can play two functions in fostering sustainable development. First, they are designed to incorporate environmental externalities into carbon technologies to "get prices right", thereby altering incentives and make sustainable technologies more competitive with existing technologies. Second, they can be designed to raise resources, often to be used for low-carbon investments.

The total value of the carbon market reached US$176 billion in 2011[9], as compared to US$159 billion in 2010. The Kyoto Protocol created the basis for international emissions trading. Under the Clean Development Mechanism (CDM) around 1.47 billion certified emission reduction (CER) units have been issued and 7510 project activities have been initiated since 2005. Under the Joint Implementation

[8] Mowery, David C, Richard R. Nelson and Ben R. Martin (2010), *"Technology policy and global warming: Why new policy models are needed (or why putting new wine in old bottles won't work)", Research Policy*, Volume 39, Issue 8, October, Pages 1011-1023.

[9] Kossoy, Alexander and Pierre Guigon (lead authors), 2013: *State and Trends of the Carbon Market 2012*, Table 1. See http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/State_and_Trends_2012_Web_Optimized_19035_Cvr&Txt_LR.pdf.

mechanism, sixteen countries issued around 39 billion emissions reduction Units (ERU) in 2011. Besides units related to the Protocol, the allowances market (US$148 billion) includes regional and national cap and trade schemes such as the European Union Emissions Trading System (EU ETS)[10], New Zealand ETS[11] and the Regional Greenhouse Gas Initiative (RGGI)[12], among others. Australia created an emissions trading mechanism in 2011 that initially will fix a price on emissions, becoming a flexible price cap and trade system in 2015. Similarly, in 2012, South Korea passed an emission trading scheme (ETS) that will be implemented in 2015. There are also sub-national ETS in several countries including Japan, the United States, Canada, and Brazil. China has approved ETS pilot plans in seven cities and provinces. These mechanisms can also be used to raise new resources. For example, as part of the EU ETS, Governments auction permits for emission allowances. Some countries have agreed to allocate a percentage of the revenues to international climate finance (e.g. Germany has agreed to allocate 15 per cent).[13]

Overall, however, the size of the carbon market remains relatively small when compared to mitigation and adaptation needs and carbon prices remain depressed. One of the main causes behind low prices is the oversupply, as allowances were pre-determined before the crisis based on more optimistic macroeconomic scenarios. Market prices, which range from less than US$7 per ton in the voluntary market and other schemes to US$18.8 per ton for EU ETS allowances, have not yet reached the levels required to make sustainable technologies more competitive with existing technologies. The High-Level Advisory Group on Climate Change Financing (AGF), established by the UN Secretary General, has stated that a price of US$20 to US$25 per tonne of CO2 is necessary to generate an estimated US$100 billion to US$200 billion of gross private capital flows for low-carbon investments.

In addition to cap and trade schemes, seventeen countries have initiated some form of national or sub-national carbon taxes. This includes carbon taxes initiated in eleven countries in Europe.[14] In North America, carbon taxes have been implemented at local levels in two cities and one county in the United States and three provinces in Canada. South Africa introduced a tax on vehicular emissions in 2010 and India introduced the clean energy tax on coal and peat. Japan is taxing fossil fuels to fund low-emission technologies. China has a resource tax on domestic sales of crude oil and natural gas and is also currently considering a carbon tax on big energy consumers by 2015.

Carbon taxes can be structured to raise new resources or to be revenue neutral. Although there has been some debate on the competitiveness effects associated with taxing carbon emissions, European countries that have had carbon taxes in place for over a decade have seen neutral or slightly positive effects on GDP – suggesting that it has not adversely affected the economy, as some had predicted. Nonetheless, most taxes are still substantially below the levels that would be required to cover all the externalities and compensate for fossil fuel subsidies.[15] For example, the carbon tax in Quebec, Canada is US$3.5 per ton, while the rate is around US$19 per ton in Ireland.

Other policies and risk-sharing mechanisms to support low-carbon investments

[10] In 2012 it included EU (27), Iceland, Liechtenstein and Norway, with Switzerland considering the creation of a Swiss cap and trade scheme to be linked to EU ETS. The introduction of additional sectors, such as the aviation sector, that were supposed to be included in EU ETS in 2013, has been delayed.

[11] New Zealand's emission trading scheme has been in place since 2008.

[12] The RGGI was formed in 2007 by 10 US states. Since 2012 it will be conformed to by 9 states, as New Jersey decided to withdraw.

[13] United Nations World Economic and Social Survey: In Search of New Development Finance, 2012.

[14] The countries are the following: Denmark, Finland, Germany, Ireland, Italy, the Netherlands, Norway, Slovenia, Sweden, Switzerland and the UK.

[15] Mowery, David C, Richard R. Nelson and Ben R. Martin (2010).

Other mechanisms may be used as alternatives to, or in conjunction with, pricing mechanisms to encourage low carbon investments. As of 2012, targets in renewable energy exist in at least 188 countries, up from 109 countries reported in 2010. At least 109 countries had some type of renewable power policy, as of early 2012, up from 96 countries in 2011.[16] Quotas or Renewable Portfolio Standards were in use in 18 countries and at least 53 other jurisdictions in 2012. Quota policies are often combined with mandates for utilities to meet their obligations through the trading of certificates. For example, in 2011, India launched a new Renewable Energy Certificate Scheme (REC) that is linked to its existing quota policies. In addition, a number of countries have instituted competitive bidding for fixed quantities of renewable electricity capacity.

FITs were in place in at least 65 countries and 27 states, as of early 2012. In addition, green investment tax credits are currently used in 18 developing countries.[17] However, the rate of adoption of new renewable energy targets and policies in place to support investments in renewable energy has fallen in recent years, partly due to fiscal pressures in developed countries, as well as due to measures to improve existing instruments and achieve more targeted results. For example, a number of governments in Europe have recently decreased financial support for renewable energy, including Spain, UK, Italy and Switzerland.[18]

Other policies to incentivize investment include financial mechanisms designed to facilitate sharing of risk between the government and the private sector. Formal models of public-private partnerships include the Build-Operate-Transfer (BOT) approach, whereby the private sector takes charge of design, financing, construction and operation of a clean energy project under a concession agreement, with a supervisory and regulatory framework. In this context, PPPs represent ways through which the public sector can leverage and attract private finance into longer-term or higher risk projects.

In the United States, PPPs are an important component of government innovation policy[19] and have been particularly helpful in overcoming the risks associated with the introduction of new technologies into the market. A prominent example is the 1986 United States Clean Coal Technology Program, which was created to address the acid rain problem. The industry covered almost two thirds of the project costs, and a Department of Energy (DOE) study found that "cost sharing between (the) DOE and industrial collaborators frequently improved the performance of RD&D programs and enhanced the level of economic and other benefits associated with such programs." [20]

In Brazil, BNDES has participated with commercial banks on a number of large wind projects. Because the transactions are too large for any single local financial institution to fund them, BNDES has provided additional capacity through direct Tier 1 loans.[21] Similarly, in Chile, CORFO (Corporación de Fomento de la Producción) has established a program aimed at supporting SMEs to optimize energy consumption

[16] Renewables 2012: Global Status Report, REN21(Renewable Energy Policy Network for the 21st Century).
[17] Ibid.
[18] "Subsidy cuts show that renewable energy is coming of age", Maria van der Hoeven, Executive Director, International Energy Agency (published 22 March 2012 in European Energy Review). Contained at web address: http://www.iea.org/media/mvdh/mvdh_renewable_subsidies.pdf.
[19] Audretsch, David B., Albert N. Link and John T. Scott (2002). "Public/private technology partnerships: evaluating SBIR-supported research". Research Policy, vol. 31, No. 1 (January), pp. 145-158.
[20] National Research Council (2001). "Energy Research at DOE: Was It Worth It? Energy Efficiency and Fossil Energy Research 1978 to 2000". Washington, D.C.: National Academy Press.
[21] "The Role of National Development Banks in Intermediating International Climate Finance to Scale Up Private Sector Investments" IADB Discussion Paper No. IDB-DP-249 (authors: Diana Smallridge, Barbara Buchner, Chiara Trabacchi, Maria Netto, José Juan Gomes Lorenzo and Lucila Serra), November 2012.

and reduce the costs associated with its use. It also introduced in 2009 a capital guarantee and risk capital fund in support of clean energy and energy efficiency projects.[22]

More broadly, governments have begun to look to financial mechanisms aimed at risk sharing, including guarantees and PPPs. The goal is to design mechanisms that incentivize private investment and leverage official resources through risk sharing between private investors and the official sector. Such guarantees have been structured to cover specific risks, such as country or convertibility risk. Using modern financial instruments, such as first loss guarantees in equity or debt funds, it is also possible to design products that limit the level of risk that investors are exposed to. As an alternative to charging a fee for first loss guarantees when private investor interest is limited, governments are considering structures whereby the government participates in the 'equity tranche' of a product in return for taking the first loss risk. In doing so they provide a first loss guarantee to private investors, while allowing taxpayers to share in potential upside returns associated with the investment.

Some developing countries have used other types of structures, such as country funds. For example, rural energy funds have been set up in countries such as Bangladesh, Mali, Senegal and Sri Lanka.[23] These funds have the triple advantage of reducing poverty, improving infrastructure (including access to electricity) and stimulating investment in green technological adaptation and diffusion. To stimulate market demand, many countries have also initiated public procurement policies. Overall, a variety of measures are increasingly being employed by both developed and developing countries to attract investments for sustainable development. This trend appears likely to expand over the longer term, despite the recent fall in the rate of adoption of new targets and supporting policies.

International Efforts

The General Assembly, in its resolution 66/288 of 27 July 2012, endorsed the outcome document of the United Nations Conference on Sustainable Development (Rio de Janeiro, Brazil, 20-22 June 2012), entitled "The future we want". The document recognized the need for significant mobilization of resources to promote sustainable development. For this purpose, Governments agreed to establish an "intergovernmental committee, comprising thirty experts nominated by regional groups, with equitable geographical representation, with a view to preparing a report proposing options on an effective sustainable development financing strategy to facilitate the mobilization of resources and their effective use in achieving sustainable development objectives" (para 255). As the Rio+20 document mandates, the analysis should cover three distinct elements: (i) the financing needs identified in the short, medium and long term; (ii) existing mechanisms and instruments and their coherence and effectiveness and (iii) new ideas and proposals regarding instruments, mechanisms, allocation and delivery, among others. Building on the Rio outcome, the General Assembly has emphasized the need to reinforce coherence and coordination and to avoid a duplication of efforts with regard to the financing for development process.

Two major objectives have to be fulfilled in order to achieve effective financing of sustainable development. First and foremost, there must be coherence and coordination between different policy processes, institutions and stakeholders at the systemic level. Increased cooperation and coordination would promote a more coherent international financial architecture that supports sustainable development. Second, the international community must accelerate mobilization and improve the allocation of resources for sustainable development across all relevant areas, stakeholders and processes of the post-2015 development agenda.

[22] Op cit IADB, November 2012.
[23] Renewables 2010: Global Status Report, REN21.