

SDG Agenda: Financing gaps in developing countries

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February 2024

1 Introduction

In 2015, the United Nations Member States agreed on the 2030 Agenda for Sustainable Development and the 17 associated Sustainable Development Goals (SDGs). The agenda succeeds the Millennium Development Goals (MDGs) which set eight international development goals for 2015 and were introduced by the United Nations in 2000. The 2030 Agenda builds on the MDGs while applying universally to all UN member states and working towards more ambitious and comprehensive goals than its predecessors. The current agenda comprises the following sustainable development goals: No poverty (SDG 1), Zero hunger (SDG 2), Good health and well-being (SDG 3), Quality education (SDG 4), Gender equality (SDG 5), Clean water and sanitation (SDG 6), Affordable and clean energy (SDG 7), Decent work and economic growth (SDG 8), Industry, innovation and infrastructure (SDG 9), Reduced inequalities (SDG 10), Sustainable cities and communities (SDG 11), Responsible consumption and production (SDG 12), Climate action (SDG 13), Life below water (SDG 14), Life on land (SDG 15), Peace, justice, and strong institutions (SDG 16), and Partnerships for the goals (SDG 17).

To achieve those economic, social, and environmental priorities, a global framework to align financing flows and policies is necessary. The Addis Ababa Action Agenda proposes action areas to provide financing flows to those countries most in need to achieve the Goals globally. The Addis Ababa Action Agenda highlights challenges faced, in particular, by African countries, least developed countries, land-locked developing countries and small island developing states, as well as middle-income countries and the global support necessary to achieve the Goals. The action areas concentrate on domestic public resources, domestic and international private business and finance, international development cooperation, international trade as an engine for development, debt and debt sustainability, addressing systemic issues, as well as science, technology, innovation, and capacity building.

These efforts have recently been challenged by multiple crises. While the COVID-19 pandemic still has a large impact on progress towards achieving the SDGs, other crises have emerged and intensified. Armed conflict and war in Ukraine, Afghanistan, Ethiopia, Venezuela, Sahel region of Africa, or the recent escalation of the Israeli–Palestinian conflict causes suffering and induces large movements of people. The war in Ukraine further causes a great amount of damage to the economy worldwide. The ongoing conflict has contributed to high inflation rates, especially driving up the prices of food and energy. This contributes to an emerging cost of living crisis. In reaction to high inflation, central banks put an end to a decade of loose monetary policy in developed countries with low interest rates and quantitative easing. At the same time, fragilities in the US and European financial system have become apparent after the recent banking sector turmoil. High interest rates and quantitative tightening pose an enormous challenge for developing countries. Global financial conditions have tightened and borrowing costs and debt sustainability risks have increased as a response. Also, environmental distress and natural disasters have intensified, slowing progress regarding the SDGs.

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According to the recent Global Sustainable Development Report³, if we continue with a business-as-usual pathway, the goals remain out of reach by 2030, or even 2050. The authors highlight the importance of initiatives through the Addis Ababa Action Agenda or otherwise to increase fiscal space, including tax reforms, debt restructuring and relief, and increased engagement by international finance institutions for the implementation of the SDGs.

Our report focuses on estimates of financing gaps for developing countries and summarizes international and national initiatives to close the financing gaps. First, we summarize estimates of financing gaps related to the SDGs. We provide a comprehensive overview of estimates in the literature and a range for financing gaps for different goals and country groupings. In particular, we focus on SDG 7 Affordable and Clean Energy and SDG 13 Climate Action. Importantly, we explore potential measurement differences among various strands of literature and summarize the factors contributing to these variations. We highlight the role of data, estimation methodologies, sensitivity to policy assumptions, sensitivity to projections, and model assumptions. Since financing gaps depend on the chosen policy path, estimates of the costs of inaction provide interesting comparisons. Further, we assess how financing needs and, therefore, financing gaps have changed over time. On the one hand, the development agenda has broadened. On the other hand, the COVID-19 pandemic created a severe disruption in the progress towards the SDGs. Second, we present an overview of approaches to close the financing gaps. We evaluate contributions of international and national initiatives, particularly those aligned with the Addis Ababa Action Agenda. We explore estimates of the effectiveness of current initiatives and how gaps can be addressed through a combination of national and international efforts.

2 Financing gaps for climate actions and sustainable development

2.1 Overview and comparison of estimates

Schmidt-Traub (2015) highlights that a framework for analyzing SDG needs must address a bandwidth of complex questions: *"How to define the major investment areas? How to deal with cross-cutting issues such as climate change adaptation and mitigation? How to quantify investment needs for ending extreme poverty? How to aggregate results taking account of gaps, overlaps, and synergies? How to deal with economy-wide effects? How to aggregate assessments across countries? How to reconcile different methodologies across a broad spectrum of SDG investment needs?"*. In the following, we summarize the literature on financing needs and financing gaps for the SDG agenda. We report estimates and elaborate on the methodologies used. We focus on comparability, aiming at providing a comprehensive assessment of needs and gaps. The literature on financing needs and gaps focuses on developing countries since achieving SDGs in developed countries primarily requires shifting expenditure as well as greater efficiency in investment. An overview of the most important papers is provided in Table 3. The table summarizes the estimates, SDG areas, countries included, as well as an overview on the methodology. In the following, we lay out more details on estimation and methodologies.

The World Investment Report by UNCTAD (2014) presents the first comprehensive assessment of investment needs in developing countries associated with the SDGs. The authors build their analysis on a meta-analytic approach. To obtain estimates of SDG investment needs, they use data as estimated and published by specialized agencies, institutions and research entities in the respective field. They report

³Independent Group of Scientists appointed by the Secretary-General (2023)

Infrastructure	McKinsey & Company (2013), Bhattacharya et al. (2012), MDB Committee on Development Effectiveness (2011), Fay et al. (2011), Airoidi et al. (2013), OECD (2006), OECD (2007), OECD (2012), WEF and PwC (2012)
Climate Change	Buchner et al. (2013), World Bank (2010), McKinsey & Company (2009), IEA (2009), IEA (2012), UNFCCC (2007), WEF (2013)
Food security and agriculture Ecosystems/Biodiversity	Schmidhuber and Bruinsma (2011), HLP (2012), Kettunen et al. (2013)

Table 1: Sources used in meta-analytical approach by UNCTAD (2014)

annual or annualized investment (which refers to capital expenditures; operational expenditure is not included) needs in developing countries using a constant price basis to allow comparison between current and future values. They focus on the following areas that are considered the most relevant areas from an investment point of view: Power, transport, telecommunications, water and sanitation, food security and agriculture, climate change mitigation and adaptation, ecosystems and biodiversity, health, and education. Sources of these estimates are summarized in Table 1. The estimates taken from the literature were sometimes not derived with the SDGs in mind but were made for sustainable development needs consistent with the SDGs. For health and education, no comparable studies were available. Therefore, UNCTAD (2014) estimates the investment needs as follows: The sum of annualized investment required to shift low-income developing countries to the next level of middle income developing countries, to shift the latter group to the next level, and so on. The methodology is similar to the methodologies used for the other areas' estimates.

UNCTAD (2014) estimates annual investment needs in key SDG sectors in developing countries between USD 3.3 and USD 4.5 trillion per year with a midpoint at USD 3.9 trillion over the period 2015-2030. With an estimated annual investment of USD 1.4 trillion (public and private), an annual investment gap between USD 1.9 trillion and USD 3.1 trillion arises (midpoint of USD 2.5 trillion). The authors emphasize investment in economic infrastructure which at the time of the report stands below USD 1 trillion per year for all sectors but will need to rise to between USD 1.6 and 2.5 trillion annually over 2015-2030. Regarding the overall financing gap, in a "business as usual" scenario, the private sector would contribute USD 0.9 trillion, which would leave USD 1.6 trillion for the public sector, including ODA. Developing countries could aim to increase private sector contribution to levels observed in developed countries. Again, the authors highlight the role of infrastructure investment. The private share in investment in infrastructure ranges between 30 and 80 percent depending on the industry. While the share is already quite high it is much higher in developed countries. Overall, if participation is encouraged to increase, the private sector could contribute up to USD 1.8 trillion, which would leave a gap of 0.7 trillion for public investment in this scenario. Globally, total investment needs are USD 5 to 7 trillion per year. Importantly, operating costs are not included in the estimates which is especially important when looking at needs associated with healthcare and education. UNCTAD highlights limitations of their study given that it is difficult to anticipate the dynamics of climate change, population growth, and interest rates.

UNCTAD (2023b) provides a follow up report that reviews the investment gap across SDG sectors in developing countries in 2023. The focus is on the following sectors: Energy (SDG 7, 13), water

Energy	IRENA (2022), McKinsey & Company (2022), IEA (2022)
Water and sanitation	Strong et al. (2020), Hutton and Varughese (2016)
Economic infrastructure	Rozenberg and Fay (2019), Oughton et al. (2022), Lefevre et al. (2016), OECD (2017), ITU (2020)
Food and agriculture	FAO, IFAD and WFP (2015), FAO, IFAD, UNICEF, WFP and WHO (2022)
Biodiversity	UNEP (2022), Deutz et al. (2020), OECD (2020)
Social infrastructure (health and education)	Stenberg et al. (2017), Kurowski et al. (2021), UNESCO (2020)

Table 2: Sources used in meta-analytical approach by UNCTAD (2023b)

and sanitation (SDG 6, 13), infrastructure (SDG 9), agrifood systems (SDG 2, 13), biodiversity (SDG 13, 14, 15), health (SDG 3), education (SDG 4). UNCTAD follows this categorization in SDG sectors in all its latest publications. The advantage of this categorization is that the categories are mutually exclusive and collectively exhaustive. The investment needs summed up for all sectors cover capital investment needed to achieve all 17 Goals. It is important to note that investment needs again refer to capital expenditure and do not include operational expenditure. UNCTAD (2023b) builds its estimates on the basis of recent studies published by specialized agencies, institutions and research entities in their respective areas of competence, using a meta-analytical approach. Sources used in the meta-analytical approach for different sectors are reported in Table 2.

Due to underinvestment and additional needs, the financing gap has increased from USD 2.5 trillion in 2015 to USD 4 trillion in 2022 (USD 3.8 - 4.3 trillion). This is 60 to 70 per cent higher than the gap estimated in UNCTAD (2014) and requires investment above USD 30 trillion until 2030. While the rate of growth of SDG investment has been below ambitions generally, it was additionally slowed down by the COVID-19 pandemic, leading to underinvestment in SDGs. Additional needs arose due to the multiple crises, including the pandemic and the triple food, fuel and finance crises. Further, estimates for investment needs for climate change mitigation and adaptation have gone up. According to simulations conducted by UNCTAD (2023b), about two thirds of the increase in the financing gap can be attributed to underinvestment and about one third to additional needs. The largest gaps are in energy, and water and sanitation. The gaps have grown by 100 and 70 per cent, respectively. Almost 70 percent of the USD 1.5 trillion increase can be traced back to those two sectors. The investment gaps in other sectors are estimated as follows: Investment in economic infrastructure other than energy mainly arises in transportation and telecommunication infrastructure. It amounts to USD 400 billion annually which is about equally split between the two sectors. Eliminating extreme poverty and hunger is estimated to require an additional USD 300 billion annually, mainly for investment in agrifood systems. In biodiversity, they estimate a gap of USD 300 billion annually. Investment in biodiversity includes investment in environmental sustainability, including nature conservation, sustainable fishing practices, ocean pollution control and sustainable forestry. Investment in health and education is estimated to lie between USD 100 billion and USD 600 billion. Most costs associated with health and education, however, are operational costs. This explains the high uncertainty regarding the financing gap.

OECD (2022) estimates an annual financing gap in developing countries of USD 3.9 trillion for 2020. According to their estimates, the gap increased by 56% compared to the pre-COVID-19 gap of USD 2.5 trillion. They assume that the financing needs have not changed but that the financing gap has

widened since sources of financing for SDGs have dropped since the pandemic. They summarize changes in financing: While there was an increase in official development finance of USD 63 billion, there was a decrease of USD 689 billion in available government revenue, a decrease in capital flows of USD 143 billion, and a decrease of USD 5 billion in remittances. Further, one has to account for COVID-19 related spending of USD 907 billion. Taking into account tightening of global financing conditions and projections, the SDG financing gap could reach USD 4.3 trillion per year from 2020 to 2025. The report remains unclear about where the estimate of USD 2.5 trillion comes from. It coincides with the number provided by UNCTAD (2014).

There further exist several estimates for specific country groupings. UNCTAD (2022) compares external financing needs (external debt amortization and current account deficits) and additional financing needs (COVID-19 related spending and SDG financing needs) to expected tax revenues and private capital inflows. They estimate a financing gap for developing countries for 2020-2025. A financing gap of USD 832.4 billion arises for low-income countries, USD 7426.8 billion for lower-middle income countries, and USD 9675 billion for upper-middle income countries. In total, this amounts to approximately USD 17 trillion for all developing countries which is about USD 3 trillion annually and is therefore in line with other estimates in the literature. The costs associated with SDGs for low-income, lower-middle income, and upper-middle income countries are USD 860.7 billion, USD 9,982.3 billion, and USD 4,835.7 billion respectively. The costs are based on UNEP (2021), UNCTAD (2014), and Gaspar et al. (2019) and computed as weighted averages by country income group. They include the following areas: Power, transport, telecommunications, water and sanitation, food security and agriculture, health, education, as well as climate change adaptation and mitigation.

Gaspar et al. (2019) develop a methodology to quantify the annual cost of achieving high performance in education, health, roads, electricity, water, and sanitation. The estimates are based on an input-output approach, which assumes that development outcomes are a function of a mix of inputs. They identify the median level of inputs for countries that perform well at the time of the study. Performance is measured by SDG index scores. Then, for each country, they calculate spending in 2030 by assigning these input levels and controlling for other factors such as demographics and the level of GDP per capita projected in 2030. For example, to obtain an investment need estimate for SDG 4 Quality Education, one would regress spending in country i on cost drivers (e.g., teacher-student ratio, teacher salaries) and on country-specific factors such as school-age population or GDP per capita. The coefficients would then be used to obtain fitted values for the countries of interest. The spending estimates are obtained for 2016 and 2030, respectively, using projections for country-specific factors for 2030. Additional spending is reported in percentage points: $\text{Spending in 2030} / \text{GDP 2030} - \text{Spending in 2016} / \text{GDP 2016}$. Importantly, the IMF reports additional spending to today's spending, reported as of 2030 in 2016 dollars and percent of 2030 GDP. The estimates do not only include capital expenses but also operational costs. Estimates do account for spending efficiencies since countries that perform well with respect to the Goals are used as a benchmark. Therefore, better-than-average spending efficiency is assumed. Also, the estimates account for intersectoral synergies since high performance in one sector, e.g. education, impacts outcomes in other sectors, e.g. health.

According to their estimates, the financing needs (for five key action areas: education, health, roads, electricity, water and sanitation) in emerging market economies and low-income developing countries amount to USD 2.6 trillion in 2030. Financing needs are defined as additional spending in 2030 compared

to 2016. USD 0.5 trillion are required for low-income countries and USD 2.1 trillion for emerging market economies. More specifically, financing needs for roads, electricity, water, sanitation are USD 1.4 billion and financing needs for education and health are USD 1.2 billion, overall for both country groupings. The overall financing needs in emerging and low-income developing countries correspond to approximately 2.5 percent of the 2030 world GDP. When looking only at low-income developing countries, the needs correspond to half a percent of 2030 world GDP and 0.9 percent of 2030 advanced economies' GDP. The size of the financing gap depends on the available resources in the economies. In emerging market economies, the average additional spending required amounts to about 4 percentage points of the group's GDP. There are substantial heterogeneities in additional spending across emerging economies. The heterogeneity reflects differences in income levels, current government spending and e.g. demographics. In low-income developing countries, the required spending is much higher and amounts to about 15 percentage points of GDP. The Asia and the Pacific region require the largest estimated spending followed by Sub-Saharan Africa.

The authors highlight limitations to their approach. First, the estimates cover only 5 out of 17 Goals. Importantly, the estimates do not include SDG13 Climate Action. They highlight that the estimates should, therefore, be viewed with caution as other areas might involve high further costs. Projections of demographics, GDP per capita, population density, or enrollment rates are decisive for the estimation.

The IMF report compares its estimates to estimates by UNCTAD (2014), Manuel et al. (2018), and Schmidt-Traub (2015). Controlling for differences in country groupings, sectoral scope, and spending definitions, and the reference years, they find that the estimates are in line with the other contributions. The report summarizes the main differences and compares the estimates for the different sectors: The IMF infrastructure calculations indicate an additional annual expenditure of approximately USD 1.4 trillion dedicated to roads, electricity, water, and sanitation in low-income countries and emerging market economies. According to UNCTAD (2014), the corresponding figure for the same sectors in developing economies stands at around USD 1.8 trillion annually (USD 2.0 trillion, inclusive of telecommunications). The disparity lies in water-related investments, with the IMF estimating these costs to be approximately USD 300 billion lower. For low-income and lower-middle-income countries, Schmidt-Traub (2015) identifies an annual infrastructure spending of USD 660 billion while the IMF estimate is USD 725 billion for the identical group of nations. In education and healthcare, the IMF forecasts additional spending of USD 1.2 trillion by 2030 in low-income developing countries and emerging market economies, with USD 600–700 billion allocated to low-income and lower-middle-income countries. Schmidt-Traub (2015) provides a lower estimate for additional spending on education and health (USD 200–300 billion) in low-income and lower-middle-income countries. This divergence stems largely from the definition of additional spending. Schmidt-Traub (2015) reports the average additional spending from 2016 to 2030. Assuming countries increase spending from 2019 to 2030 to reach the IMF spending level, the average annual additional spending according to the IMF is less than USD 400 billion. UNCTAD (2014) indicates capital spending in these sectors at a level equivalent to a reasonable share (20 percent) of the IMF's total current and capital spending estimates. The IMF estimates align with those proposed by Manuel et al. (2018) who look into costing of the three core social sectors: education, health, and social protection. Manuel et al. (2018) calculate the annual financing gap for 145 countries while focusing on 48 under-resourced countries. To obtain the gap, they assume that half of potential tax revenues will be devoted to achieve the financing needs. The reported annual financing gap is USD 150 billion among the 48 under-resourced countries. Climate mitigation and adaptation costs constitute approximately 20–40 percent of infrastructure spending. UNCTAD (2014) approximates these costs at around USD 800 bil-

lion annually in developing economies, constituting 40 percent of their infrastructure spending estimate. Schmidt-Traub (2015) estimates mitigation and adaptation costs at approximately USD 130 billion for low-income and lower-middle-income countries, representing 20 percent of the infrastructure spending estimate. It is noteworthy that the IMF does not incorporate the costs associated with climate mitigation and adaptation in its analysis.

The IMF (Benedek et al., 2021) provides a post-pandemic assessment of the SDG agenda with a focus on education, health, roads, electricity, and water and sanitation as previous IMF publications (Gaspar et al., 2019). Their analysis builds on four case studies. Central to the case studies is a macroeconomic framework that focuses on the long-term relationship between investment and growth. Investment in the SDGs translates into more economic growth since it increases human capital, private capital and publicly and privately financed public capital. The authors estimate that an additional spending of 14 percent of domestic GDP annually between 2021 and 2030 will be necessary to achieve the SDGs in the five sectors⁴. This is approximately 2.5 percentage points (or 21 percent) higher than before the pandemic. If one were to additionally include long-term economic costs due to long-term effects on human capital and growth potential, the financing needs increase by an additional 1.7 percentage points. Those additional needs have to be financed by a combined effort of the public and private sectors. Within their model framework, they account for long-term effects by increasing the depreciation of human capital (skill loss due to unemployment), decreasing the elasticity of new human capital to education spending (lower benefits of schooling), and decreasing the diffusion of human capital into the economy (difficulties when entering the labor market).

Schmidt-Traub (2015) reports average additional spending needs between 2015 and 2030 (in 2013 dollars). The paper translates the 17 Goals into eight investment sectors: (1) health, (2) education, (3) social protection, (4) food security and sustainable agriculture, (5) infrastructure (energy access, low-carbon energy infrastructure, water and sanitation, transport infrastructure, telecommunication infrastructure), (6) ecosystem services and biodiversity, (7) data for the SDGs, and (8) emergency response and humanitarian work. Additional investment needs for climate change mitigation and adaptation are considered within each investment sector. The paper focuses on low-income and lower-middle-income countries following the World Bank classification.

Spending needs in low and lower-middle-income countries are estimated at USD 1.4 trillion per year (USD 343-360 billion for low-income and USD 900-944 USD for lower-middle-income countries). This corresponds to approximately 4 percent of the countries' GDP measured in USD PPP and 11.5 percent of GDP in US dollars at market exchange rates. They argue that half of the investment needs can be privately financed. Additionally, even if domestic resources increase significantly, a financing gap of USD 152-163 billion per year remains. This is equivalent to 0.22-0.26 percent of developed countries' GDP. Globally, an investment need of 1.5 - 2.5 percent of world GDP arises. Schmidt-Traub (2015) draws on estimates in the literature. The paper introduces a suitability score with the aim of evaluating and comparing the needs assessment. The suitability score is set according to the following criteria: coverage, development, and key gaps, clear identification of inputs, methodology, goal-based approach (back-casting), peer review, types of expenditure considered, geographical scope and disaggregation,

⁴The authors list three reasons why the estimate deviates from the 15 percent estimated by Gaspar et al. (2019): 1) the framework accounts for the effect of investment on growth, 2) country coverage, 3) differences in base years, 2016 vs. 2020.

consideration of climate change mitigation and adaptation, and consideration of economy-wide effects. Schmidt-Traub (2015) adjust the identified needs to ensure comparability across sectors and to enable aggregation. The authors adjust accordingly the geographic scope, the nature of interventions considered, or the inclusion of capital vs. operating expenditure. All numbers are annual non-discounted cash-flows. The investment sector specific estimates follow. Total annual investment needs for 2015-2030 (in 2013 dollars) are USD 69 billion in health, USD 194 billion in education, USD 148 billion in agriculture and food security, USD 321-347 billion in energy, USD 42-45 billion in water and sanitation, USD 396 billion in transport and infrastructure, USD 189 billion in telecommunications infrastructure, USD 11-28 billion in ecosystems, including biodiversity, USD 0.5 billion in data for the SDGs, and USD 8-23 billion for emergency response and humanitarian work.

Sachs et al. (2019) review the literature on SDG needs assessment in the following sectors: health, education, infrastructure (including climate adaptation and mitigation), agriculture, biodiversity and ecosystem services, social protection, data for the SDGs and justice. They focus on low-income developing countries (LIDC). In particular, the 59 LIDC as classified by the IMF correspond to all countries classified by the World Bank as low-income countries (LIC) with the exception of North Korea and Syria, and a subset of low-middle-income countries (LMIC). Those countries combined have a population of 1.5 billion people of which 645 million are in LIC and 904 million are in the LIDC subset of LMIC. In total, they calculate an average annual SDG financing gap of USD 400 billion between 2019 and 2030.

The authors select studies according to the following criteria: transparency of the methodology, disaggregation of unit costs by country or by income categories to calculate the needs for the respective LIDC, and whether the proposed needs are ambitious enough to reach the Goals. The focus is on unit costs per capita required in each sector. Specifically, they report the "minimum costs possible to achieve the basic coverage of SDG related services". Basic coverage refers to the minimum level to achieve basic human needs. In services, the assumption is a 100 percent coverage from 2019 while in infrastructure the assumption is a scale-up to achieve universal coverage in 2030. For example, the healthcare estimate is USD 86 per person per year. The unit costs are multiplied with the population projections. Sachs et al. (2019) further account for government costs that are not strictly SGD costs, in specific, "general government services", "defense", or "public order and safety". Together, those expenditures are 6 percent of GDP. The financing gap estimates depend on population projections as well as assumptions about fiscal resource mobilization. Sachs et al. (2019) expect that the population in LIDC will raise to just under two billion by 2030. Further, it is assumed that countries will increase the ratio of government revenues to GDP by 5 percentage points between 2019 and 2030.

All values are reported in real inflation-adjusted 2019 USD. The total per capital annual costs are estimated at USD 414 for the LIC and USD 541 for LIMCs. If non-SDG public expenditures are added, the costs rise to USD 460 and USD 644, respectively. The total SDG investment needs are USD 753 billion in 2019 and USD 1000 billion in 2030, which is USD 874 USD on average between 2019 and 2030. Adding non-SDG public expenditure, they arrive at investment needs of USD 1011 billion annually. The largest shares go to the health sector (22 percent), the education sector (26 percent), and infrastructure (21 percent).

To arrive at the financing gap, the report compares the needs (including non-SDG public expenditures) with the available domestic budget revenues: domestic revenue mobilized plus projected ODA flows plus projected philanthropic flows. The scenario assumes immediate and full coverage of basic SDG services as of 2019. As highlighted above, another critical assumption is that countries raise government revenues to

GDP by 5 percentage points by 2030⁵. Data for 2019 government revenue to GDP ratios as well as data on projected GDP are taken from the IMF (IMF, 2019). Government revenues comprise taxes, profits of state-owned enterprises, social payments such as payroll taxes for pensions, income on public assets, as well as grants received from abroad. The available financing further includes Official Development Assistance (ODA) and philanthropy. ODA is assumed to continue as a constant fraction of Gross National Income of the donor countries which is assumed to grow by two percent annually. They arrive at an annual per capita financing gap estimate in LIDC of USD 230 which corresponds to a total SDG financing gap of average USD 400 billion per year (this equals 15 percent of GDP for the group of countries). That are approximately 0.4 percent of annual Gross World Product and 0.7 percent of annual aggregate GDP of advanced economies.

Sachs et al. (2019) compare their results to Gaspar et al. (2019) and find that differences in the estimates reflect differences in country groupings (49 LIDC in Gaspar et al., 2019, vs. 59 LIC and LMIC in Sachs et al., 2019), sectoral coverage, definition of spending, and reference years. When adjusting sectors, country groupings and definitions across studies, the estimates are comparable.

Kharas and McArthur (2019) provide estimates for financing needs and financing gaps for 10 SDG-related sectors in 134 low- and middle-income countries. The SDG sectors are 1) social spending, with emphasis on ending extreme income poverty, 2) agriculture and rural development, with emphasis on achieving zero hunger, 3) health, 4) education, 5) water and sanitation, 6) energy, 7) transportation, 8) flood protection, 9) biodiversity conservation, and 10) access to justice. They build their analysis on sectoral studies, relying on country-specific estimates whenever possible. Their focus is on public spending for the SDG economy. They provide estimates for public spending for 190 countries in 2015, including developing and developed countries. Total overall public sector spending on the SDGs incorporates investment and recurrent expenditures. Low-income country governments spend around USD 115 per capita per year on SDGs (USD 8 for agriculture, USD 8 for health, USD 26 for education, USD 13 for social spending, USD 51 for infrastructure, USD 1 for conservation, and USD 8 for justice), lower-middle-income countries spend approximately USD 267 per capita per year, upper-middle-income countries spend USD 2200 per person per year, and high-income countries spend about USD 12,753.

The gap is identified by subtracting projected public spending from estimated needs. To calculate public spending for SDGs in 2025, they take a country's SDG spending as a share of GDP in 2015 and apply the share to projected GDP in 2025. Specifically, they apply a 1.13 multiplier to the spending share assuming that the country increases its spending until 2025. The additional spending contributes approximately USD 80 billion across developing countries in 2025.

The paper estimates a minimum public spending gap for SDGs that averages USD 344 per capita per year for low-income countries, USD 583 for lower-middle-income countries and USD 2,559 for upper-middle-income countries. The aggregate 2025 SDG gaps by income group are the following: USD 150 billion for low-income countries, USD 549 billion for lower-middle-income countries, and USD 223 billion for upper-middle-income countries. Across all developing countries, this amounts to USD 922 billion. The authors use the World Bank income classifications. The authors argue that their estimate might be lower compared to other contributions for two reasons. First, they do find that a number of countries do not face a financing gap in 2024. Second, they assume that countries will increase their spending as economies grow.

⁵E.g., if a country collects 20 percent of GDP in revenues today, it increases revenues to 25 percent of GDP by 2030 in fixed percentage increments per year.

Summers et al. (2023) calculate additional spending necessary to achieve the SDGs in developing countries (excluding China) relative to pre-pandemic levels. They follow a deductive approach by first summarizing the investment necessary to achieve the SDGs and then identifying available financing. The authors argue that the numbers, therefore, do not reflect an ambitious program but rather just what is necessary. They highlight that the figures consistent with Songwe et al. (2022) but do not provide any further details on the methodology to obtain the estimate of USD 3 trillion. Additional spending of USD 3 trillion (constant 2019 USD) per year is needed by 2030 compared to 2019. USD 1.8 trillion are needed to finance additional investments in climate action (a 4 fold increase in adaptation, resilience and mitigation) and USD 1.2 trillion are necessary to reach other SDGs, foremost in health and education. This corresponds to a 75 percent increase in spending by 2030. In their report, they focus on the role of international development finance in closing the financing gap.

Traeger et al. (2021) focus on the costs of achieving the SDGs in least developed countries (LDC). Least developed countries are characterized by heightened structural vulnerabilities which were especially evident during the pandemic. The authors develop a LDC-specific costing methodology that emphasizes SDGs relevant for structural transformation and suggest two complementing estimation approaches. First, they project growth and investment needs using macroeconomic elasticities. Second, they calculate spending requirements and identify the financing gap for service spending based on unit costs. The report focus on the following selected SDGs: achieving an annual rate of economic growth of 7 percent (SDG 8.1), eradicating extreme poverty (SDG 1.1), doubling the share of manufacturing (industry) in GDP (SDG 9.2), universalizing access to health, education, and social protection services (SDGs 3.8, 4.1), ensuring the conservation, restoration, and sustainable use of ecosystems (SDG 15.1).

To obtain cost estimates for SDGs 8.1, 1.1, and 9.2, the report calculates investment needs through country-specific elasticities given differences in state capacities, institutions, economic infrastructure, and human capital levels. The elasticities help produce fixed investment levels and GDP growth rates needed to achieve the SDGs. For example, growth-investment elasticities to obtain the investment needs for SDG 8.1 are calculated using panel time series methods. The growth-investment elasticity measures the impact of a 1 percentage point increase in the investment rate on GDP growth.

Since expenditures to social and environmental services (SDGs 3.8, 4.1, 15.1) are classified as current spending, the report applies a unit cost methodology for calculating the costs related to the remaining SDGs. The unit costs to reach universal services in 2030 are multiplied and subtracted from current expenditure to obtain a financing gap. Progress of interventions is assumed to be linear and used to calculate annual needs. For example, unit costs per capita to calculate the financing gap are USD 85.7 for health, USD 122.4 for education and USD 4.9 for biodiversity conservation. This corresponds to an average expenditure of 12, 16.9 and 0.7 percent of GDP in these sectors, respectively.

Summing up the fixed investment needs and the spending requirements, total average annual financing needs in LDC range between USD 876 and 1,465 billion. This corresponds to 80134 percent of LDC GDP in 2019. Reaching the SDGs would require doubling the annual expenditure in health, education, social protection, and ecosystems. Further, high average annual growth rates are required which, however, differ considerably among countries. Overall, the results can be summarized as follows. For SDG 8.1, a 7 percent growth rate is required. Achieving the goal of ending extreme poverty (SDG 1.1) demands an average growth rate of 9 percent over the entire decade. In contrast, the demands for structural transformation are considerably more substantial, as LDC would be required to attain an

average annual growth rate of 20 percent to meet the objective of doubling the manufacturing sector's share of GDP (SDG 9.2). However, the highest annual growth rate achieved in the 2000s was 5.2 percent.

Comparing these studies proves challenging due to variations in methodologies, country coverage, SDG sectors, projections, time frames and baselines. Vorisek and Yu (2020) caution that cross-country costing exercises related to the SDGs may be misleading. This is attributed to issues such as double counting, sensitivity to underlying assumptions, underplaying policy and institutional dimensions, disparities between short and long-term dynamics, and challenges in discounting costs. We continue our analysis by providing an overview of key differences in methodologies and assumptions in Section 2.2. We further outline explanations for a widening of the gap in Section 2.3 and provide a benchmark and range for the financing gap for SDG in developing countries in Section 2.4.

Table 3: SDG Financing Gaps Estimates

	Financing Gap	Areas	Countries	Methodology
UNCTAD (2014)	Investment need of USD 3.9 trillion, investment gap of USD 2.5 trillion annually 2015 - 2030	Power, transport, telecommunications, water and sanitation, food security and agriculture, climate change mitigation and adaptation, ecosystems and biodiversity, health, education	Developing countries	Meta-analytical approach, focus on investment in capital
UNCTAD (2023b)	Investment gap of USD 4 trillion annually 2022 - 2030	Energy (SDG 7, 13), water and sanitation (SDG 6, 13), infrastructure (SDG 9), agrifood systems (SDG 2, 13), biodiversity (SDG 13, 14, 15), health (SDG 3), education (SDG 4)	Developing countries	Meta-analytical approach, focus on investment in capital
OECD (2022)	Financing gap USD 3.9 trillion in 2020, USD 4.3 trillion annually 2020 - 2025	unspecified	Developing countries	Change in financing gap is based on changes in financing flows
UNCTAD (2022)	USD 832.4 billion for low-income, USD 7,426.8 for lower-middle income, USD 9,675 for upper-middle income for 2020-2025	Power, transport, telecommunications, water and sanitation, food security and agriculture, health, education, and climate change adaptation and mitigation	Developing countries (low-income, lower-middle income, upper-middle income), World Bank classification, excluding China	Financing needs are taken from Gaspar et al. (2019), IMF SDG Financing Tool

Table 3: SDG Financing Gaps Estimates

	Financing Gap	Areas	Countries	Methodology
Gaspar et al. (2019)	Additional spending required in 2030 of USD 2.6 trillion (2.5 percent of the 2030 world GDP), USD 0.5 trillion in low-income countries, USD 2.1 trillion in emerging economies	Education, health, roads, electricity, water, sanitation (SDG 3, 4, 6, 7, 11)	155 countries, emphasis on low-income countries and emerging market economies	Input-Output approach
Schmidt-Traub (2015)	Average financing need between 2016 and 2030 of USD 1.4 trillion (in 2015 dollars), USD 400 billion in low-income and USD 1 trillion in lower-middle-income countries, financing gap of USD 152-163 billion per year	17 Goals, 8 investment sectors: (1) health, (2) education, (3) social protection, (4) food security and sustainable agriculture, (5) infrastructure (energy access, low-carbon energy infrastructure, water and sanitation, transport infrastructure, telecommunication infrastructure), (6) ecosystem services and biodiversity, (7) data for the SDGs, (8) emergency response and humanitarian work	The World Bank classification of low-income and lower-middle income countries	Literature review
Sachs et al. (2019)	Average annual financing gap of USD 400 billion between 2019 - 2030 (in 2019 dollars)	Health, education, infrastructure (including climate adaptation and mitigation), agriculture, biodiversity and ecosystem services, social protection, data for the SDGs, justice	low-income developing countries	literature review on financing needs with a focus on unit costs, obtain financing gap by subtracting available domestic budget revenue

Table 3: SDG Financing Gaps Estimates

	Financing Gap	Areas	Countries	Methodology
Kharas and McArthur (2019)	Financing gaps in 2025: USD 150 billion in low-income, USD 549 billion in lower-middle-income, USD 223 billion in upper-middle-income countries, USD 922 billion overall	10 SDG sectors: social spending, agriculture and rural development, health, education, water and sanitation, energy, transportation, flood protection, biodiversity conservation, access to justice	134 low and middle income countries	Literature review of sectoral studies, relying on country-specific estimation to obtain financing gap subtract public spending
Benedek et al. (2021)	Additional annual spending of 14 percent of GDP (2.5 percentage points higher than before the pandemic)	Education, health, roads, electricity, water and sanitation	Low-income developing countries and emerging markets economies: Rwanda, Cambodia, Nigeria, Pakistan	Four case studies, with a focus on long-term relationship of investment and growth
Summers et al. (2023)	Additional annual spending necessary relative to pre Covid-19 level: USD 3 trillion by 2030, of which USD 1.8 trillion for climate action	All SDGs, focus on climate action	Developing countries, excluding China	Deductive approach
Traeger et al. (2021)	Total annual financing needs of between USD 876 and 1,465 billion until 2030	SDGs relevant for structural transformation: SDG 8.1, 1.1, 9.2, 3.8, 4.1, 15.1	Least developed economies	Investment needs by calculating country-specific elasticities, unit cost methodology for services

2.2 Estimation methodologies

In this section, we summarize the estimation methodologies used in the previously discussed papers and discuss potential factors driving differences in the estimates. While we have outlined a broad literature on financing needs and gaps for developing countries, the estimates seem difficult to compare and estimates seem to vary a lot across papers. Broadly, the discussed papers either rely on a meta-analytical approach or employ their own models. Underlying the estimations are demographic and growth projections as well as input and unit costs. We identify the following factors driving differences in the estimates: Definitions of spending needs and gaps, time period and reference year, scope of SDGs covered, geographical scope, as well as projections of e.g. growth or demographics.

While some papers report annualized investment needs and gaps (UNCTAD, 2014, 2023b; OECD, 2022; Schmidt-Traub, 2015; Sachs et al., 2019), others (UNCTAD, 2022) estimate additional financing needs within specific time frames (e.g. between 2020 and 2025). Gaspar et al. (2019) on the other hand report additional spending required in 2030. Estimates are reported in absolute terms or in many cases as percent of countries or world GDP. Another important distinguishing factor is the inclusion or exclusion of operational expenditure. Moreover, the papers account for different time horizons and use different reference years in their analyses.

Another driver of differences in the estimates is the scope of SDGs covered in the analysis. While some (Schmidt-Traub, 2015) claim to cover all SDGs within their analysis, others (Gaspar et al., 2019) focus on a small selection of SDGs arguing that those are the driving forces when it comes to financing needs. An important factor is the inclusion of climate action in the analysis. While the papers generally focus on developing countries, their specific geographic scope varies. In order to compare estimates, the country coverage has to be adjusted for.

While the above factors need to be considered to make estimates more comparable among the literature, the following assumptions impact the financing needs and financing gaps estimates more broadly. The estimates rely on projections of economic growth rates, poverty rates, population growth rates, ratios of different spending indicators in relation to GDP, or any other country specific factors. One needs to take into account the sensitivity of estimates to changes in the projections, e.g. due to unforeseen crises. For example, Gaspar et al. (2019) uses projections of demographics and level of GDP per capita in 2030 for their analysis. UNCTAD (2014) relies on projections of people living in poverty. Sachs et al. (2019) multiplies unit costs of specific SDGs with population projections. Furthermore, they assume that countries will increase the ratio of government revenues to GDP by 5 percentage points between 2019 and 2030. Kharas and McArthur (2019) compare two scenarios based on different spending-to-GDP ratios. First, they assume that the ratio of SDG spending to GDP does not change between 2015 and 2025 and apply the 2015 ratio for their projections. Second, they assume that countries raise their spending relative to economic growth by applying a multiplier of 1.13 relative to the country's GDP per capita growth rate. The second scenario generates smaller needs gaps for 2025. Overall, the financing gap decreases by USD 83 billion when allowing for an increasing spending to GDP ratio.

The mentioned papers were published pre-pandemic which raises questions about how those projections might have changed. Also, other crises like the ongoing wars, the fuel and food crisis, or the increasing interest rates might impact the countries' trajectories. UNCTAD (2022) discusses the role of the pandemic for the projections used in their study. They focus on the revenue side where they identify economic growth to be the main driver of increased tax revenue. Their projections of economic growth, however, are far from pre-pandemic trends. Countries will not return to their growth trajectories before

2030 which is the reference year of their estimates.

Other issues that might influence the estimates are double counting or underplaying policy and institutional dimensions.

2.3 Widening of the gap

As argued above, there are mainly two reasons for a widening of the financing gap: underinvestment and additional needs (UNCTAD, 2023b). While SDG investment remained below ambitions more generally, a major reason for underinvestment was the COVID-19 pandemic. Further, we have seen additional needs due to multiple crises, including the food, fuel, and financing crises. Also, investment needs for climate change mitigation and adaptation have increased.

The pandemic has had wide-reaching effects on developed and developing economies and there is little doubt that the economic consequences will not be transitory. Pre-pandemic financing gaps for achieving the SDGs are, therefore, expected to further exacerbate. Countries faced high pandemic-related financing needs, while at the same time facing falling public revenue because of the associated economic downturn. The pandemic further pushed millions of people into extreme poverty, primarily in low-income developing countries in sub-Saharan Africa and South Asia (Benedek et al., 2021). The reduced fiscal capacities in developing countries, and consequently, the incapability to generate domestic resources for development, are expected to persist beyond the immediate effects of the COVID-19 pandemic.

UNCTAD (2022) summarizes challenges on the revenue and the expenditure side. On the expenditure side, vaccine roll-outs have been slow, which suggests that financing needs will remain high for a considerable time. Also, non-pandemic related expenditures have been postponed during the pandemic but must eventually be reinstated, which leaves less budget for investment in structural transformation. Further, many developing countries face high servicing costs on public external debt obligations. For example, as a share of government revenue, these high servicing costs amounted to 11.4 percent in least developed economies, 8.5 percent in middle-income economies and over 20 percent in small island developing states in 2020.

On the revenue side, the focus is on economic growth which is the main driver of tax revenues. Available government revenues (government revenues minus debt service repayments) decreased by 22 percent in 2020 (OECD, 2022). This corresponds to a reduction of USD 689 billion from USD 3.1 trillion in 2019 to USD 2.4 trillion in 2020. Growth is further projected to remain below pre-pandemic trends. Factors exacerbating below-trend growth in developing countries are worsening trade balances that translate into foreign currency shortages and reduced government revenues from custom duties, paired with a sharp reduction in external financial resources. Capital flows did show not to be reliable during the pandemic. Capital outflows in 2020 reached the highest level recorded in emerging market economies as a consequence of high levels of uncertainty. Net capital inflows to low-income countries decreased by 85 percent from a value of USD 8.3 billion pre-pandemic to USD 1.2 billion in 2021. Similarly, lower-middle-income countries saw a fall of 75 percent (USD 68.8 billion to USD 16.8 billion). Net flows to upper-middle income countries have been negative since 2018 and have seen an upward trend. Another important indicator for achieving the SDG agenda is the tax-to-GDP ratio, since tax systems and public spending are important to support the agenda but also to incentivize spending that is favorable for SDG outcomes. UNCTAD (2022) propose a tax-to-GDP benchmark of between 15 and 20 percent to achieve the agenda. Due to the pandemic, 70 percent of countries experienced declines in their tax-to-GDP ratios.

UNCTAD (2022) estimate spending on the COVID-19 response between 2020 to 2025 by developing countries using advanced countries' spending as a benchmark. According to their estimations, the response over this time span is USD 166.8 billions in low-income countries, USD 3,262 billion in lower-middle-income countries, and USD 9,285.9 billion in upper-middle income countries. This corresponds to 64 percent, 36 percent and 74 percent of tax revenue of the respective country groups. The large spending increases are confirmed by OECD (2022) who report an increase in government spending related to the COVID-19 pandemic for all developing countries. The immediate response is estimated at USD 907 billion which corresponds to nearly 40 percent of total government revenues available in developing countries in 2019.

Overall, OECD (2022) estimates that the decrease in available government revenue and the decrease in capital flows and remittances led to a widening financing gap of USD 2.5 billion to USD 3.9 billion. This corresponds to a 56 percent increase in the SDG financing gap in 2020. The only financing that increased during the pandemic was official development finance. Developed economies increased emergency funds by increasing ODA. In 2020, ODA reached the highest level observed of USD 162.2 billion constituting an increase of 7 percent to the previous year (OECD, 2022). Benedek et al. (2021) look at additional financing needs in low-income developing countries. They argue that the additional annual financing needs as percent of GDP increased by 2.5 percentage points due to the pandemic. This amounts to an additional USD 59 billion a year that can be contributed to the pandemic. If further accounting for long-term economic costs due to damage to human capital, the needs increase by an additional 1.7 percentage points according to their analysis.

Current UNCTAD projections rule out the possibility of reverting to pre-pandemic trends in economic growth until after 2030. Traeger et al. (2021) argues that least developed countries were hit especially hard by the pandemic. As argued in Section 2.1, to achieve the SDGs in least developed countries, GDP growth rates between 7 and 20 percent are necessary. However, the highest annual growth rate achieved in the 2000s was 5.2 percent. Moreover, these growth rates were achieved before the pandemic. The pandemic led to the worst growth performance of LDC in 30 years and might bring about lingering effects due to a poor economic and social performance in the medium term. Further, there is high uncertainty stemming from large differences in growth across and within regions. This puts pressure on the revenue side since economic growth is the key driver for tax revenue which is essential to generate domestic revenue.

Contributing to tight budgets in both developed and developing economies, Russia's war against Ukraine further increased global uncertainty and required additional spending to address the humanitarian emergency and cover refugee costs. This contributed to the slow recovery of government revenue in developing countries. Since budget is needed to resolve short-term problems arising due to the war, the crisis diverts resources from longer-term priorities, i.e. the achievement of SDGs. The ongoing conflicts, supply-side disruptions as well as extreme weather impacts have had severe implications for prices. Since the beginning of 2021, consumer prices in developing economies have risen by a cumulative 21.1 percent, and annual inflation is projected to still be above 10 percent in 2024 in a quarter of all developing countries (United Nations, 2024). This is particularly worrying as higher prices disproportionately affect the poorest households. Higher prices might push people back into poverty. High inflation, therefore, directly sets back achievements related to poverty alleviation (SDG 1). Also, public finances of countries that rely on food and energy imports have been particularly affected by increases in food and energy prices (United Nations, 2023). In times of fiscal consolidation, countries often reduce social expenditures, therefore

exerting an indirect impact on the poorest.

Further, UNCTAD (2022) argues that spillover effects from higher interest rates in advanced economies might be potentially very damaging for developing countries given their high levels of debt: The challenge stems from the adverse effects of elevated US interest rates on developing countries' already vulnerable financial situations. Elevated yields result in increased interest payments on newly issued debt, potentially leading to a rise in debt-to-gross domestic product ratios if governments borrow extensively to cover these payments (as the relationship between bond yields and prices is such that yields move inversely to prices). Therefore, high borrowing costs will be particularly damaging for countries with already large debt service burdens and foreign currency denominated debt. Increased US interest rates could also limit the capacity of developing countries to lower their own rates, even when domestic inflation decreases. This restriction arises from the concern that such rate cuts might undermine their currencies, consequently causing inflation through elevated import prices. Additionally, higher rates reduce the present value of future cash flows, making risky innovation and green projects less attractive for private investors, so more risk sharing with the public sector may be needed. Tighter financial conditions also increase the importance of solid macroeconomic policies: Emerging markets with weaker macroeconomic frameworks may struggle to retain access to financial markets and thus lack funding needed to support green and inclusive growth.

Despite incipient recoveries from the pandemic, central banks in 85 percent of developing economies hiked policy rates in 2022. Following a significant economic downturn in 2022 prompted by the rapid increase in rates and a robust US dollar, foreign currency debt in developing countries has struggled to rebound. The rapid withdrawal of monetary support, albeit targeting price stability, has thus contributed significantly to higher financial stability risks. If borrowing costs were to remain elevated for an extended period, this would also contribute to the predicament. Presently, 23 percent of developing nations face borrowing costs exceeding those of the US by over 10 percentage points, a stark increase from the less than 5 percent recorded in 2019. This shift underscores the heightened strain on these economies. Consequently, the proportion of government revenues allocated to debt interest payments has reached its highest level since at least 2010, as per the World Bank's assessment (World Bank, 2023). Lower-income countries are anticipated to feel a pronounced impact from increased borrowing expenses, primarily due to the fact that a significant number of them accumulated substantial debt burdens throughout the COVID-19 pandemic.

In this vein, the OECD (2022) argues that while the financing gap in developing countries increased to USD 3.9 trillion in 2020, the tightening of global financing conditions increased the gap by another USD 0.4 trillion to USD 4.3 trillion per year from 2020 to 2025. Similarly, United Nations (2023) shows that the tightening has fuelled debt sustainability concerns in a number of developing countries, as the costs for infrastructure projects have increased: An increasing share of government revenues are being devoted towards debt service, reaching about 2 per cent of GDP and 10 per cent of public revenues in 2022 on average. Moreover, many developing countries are experiencing bouts of sizeable capital outflows and currency depreciations during the year, investor risk appetite was also dampened by the uncertain growth outlook, and persistent inflation and continued geopolitical tensions are the unintended side-effect of interest rate hikes by the Fed. By the end of 2022, nearly 60 percent of all low-income countries were at high risk of or in debt distress (United Nations, 2023). For many developing countries, capital outflows and currency depreciations compounded pressures to raise interest rates.

The authors also argue that the performance of financial markets differed considerably between de-

veloping countries as investors scrutinized each country's fundamentals. Financial markets were subject to stronger pressures in commodity-importing countries, particularly those with inherent structural and policy weaknesses. For many of these economies, the weakening of domestic currencies against the dollar not only increases the burden of servicing debt denominated in foreign currencies, but also exacerbates challenges caused by higher international prices for food, fuel and fertilizer. In 2022, about one fifth of developing economies liquidated more than 15 per cent of their international foreign reserves to cushion the pressure on domestic currencies, with larger losses faced by countries with large macroeconomic imbalances and higher inflation.

In conclusion, the financing gap has widened recently due to two major factors: Underinvestment and additional needs. Past years were marked by underinvestment in developing countries mainly due to the effects of the COVID-19 pandemic which largely decreased fiscal capacities and growth outlooks. Further crises triggered by Russia's war against Ukraine, intensified underinvestment in the SDG agenda and increased additional needs, e.g. to cover costs related to the humanitarian emergency. Further, global financial tightening, driven by steep and synchronised rate hikes by major central banks, has had significant negative spillovers on developing countries and deteriorated their macro-financial situations in multiple ways, contributing to widening the financing gap. Last, investment needs for climate change mitigation and adaptation have increased.

2.4 The financing gap

In the following, we summarize the information above to obtain estimates for different country groupings. While the focus of this section is on determining the financing gap, Table 4 shows estimates for annual financing needs in USD billion obtained from the literature. For developing countries, the estimated needs range between USD 2,613 billion (sum of all UNCTAD, 2022 estimates for LIC, LMIC, UMIC) and USD 4,500 billion (UNCTAD, 2014 provides a range of estimates between USD 3,300 billion and USD 4,500 billion with a mid-point of USD 3,900 billion). Needs are highest in LMIC and range between USD 1,000 billion and USD 1,663 billion. Most interestingly, the needs in LIC and LMIC are quite large in terms of the country groupings' GDP. For instance, Schmidt-Traub (2015) estimate that in LIC, financing needs amount to USD 400 billion which is 88.69 percent of LIC's GDP in 2022. However, it amounts to only 0.39 percent of World GDP and 0.71 percent of advanced countries' GDP.

Table 5 summarizes estimates of the annual financing gap in USD billion for different country groupings. First, we look into the estimates for developing countries. Figure 1 illustrates the annual financing gap estimates for the period 2015 to 2030. Half of the estimates lie between USD 2,500 billion and USD 4,000 billion with a median of USD 3,000 billion. The picture changes when splitting the estimates before and after 2020. Before 2020, the midpoint of the gap was USD 2,500 billion while it increased to almost USD 4,000 billion after 2020. As a share of developing countries' 2022 GDP, the annual financing gap is on average somewhat below 8 percent (see Figure 7). After the pandemic it increased to approximately 10 percent of developing countries' 2022 GDP (see Figure 8). As explained in Section 2.3, the financing gap has widened due to underinvestment and additional needs that are associated with multiple crises.

A financing gap of USD 4,000 billion is consistent with the estimate provided by UNCTAD (2023b). This amounts to 10.20 percent of developing countries' GDP or 3.95 percent of the World's GDP and 7.1 percent of advanced economies' GDP in 2022. The lowest finance gap estimate is by Kharas and McArthur (2019). As highlighted in Section 2.1, they argue that their estimate is low in comparison given that they do not find a financing gap in 2024 for a number of countries and that they assume that

	in billion USD	Time Period	Country Grouping	% of 2022 World GDP	% of 2022 country grouping GDP	% of 2022 advanced economies' GDP
UNCTAD (2014)	3,900	2015- 2030	developing countries	3.85%	9.95%	6.92%
UNCTAD (2022)	143.5	2020- 2025	LIC	0.14%	31.82%	0.25%
	1,663.7	2020- 2025	LMIC	1.64%	20.42%	2.95%
	806	2020- 2025	UMIC	0.80%	2.63%	1.43%
Schmidt-Traub (2015)	1,400	2016- 2030	LIC, LMIC	1.38%	16.28%	2.48%
	400	2016- 2030	LIC	0.39%	88.69%	0.71%
	1,000	2016- 2030	LMIC	0.99%	12.27%	1.77%
Sachs et al. (2019)	874	2019- 2030	LIDC	0.86%	33.06%	1.55%
Traeger et al. (2021)	1,170	2019- 2030	LDC	1.15%	84.80%	2.08%

Notes: The table shows the annual financing needs in billion USD and as % of 2022 World GDP, the country grouping GDP, and advanced economies' GDP. Whenever the financing needs were not available on an annual basis, we take the average value. If the paper provides a range of values, we take the midpoint.

Table 4: Annual financing needs

countries increase their spending as economies grow. Notably, the financing gap in LIC while seeming relatively large in terms of country grouping GDP, is relatively small in terms of World GDP (0.14-0.15 percent) and in terms of advanced economies' GDP (0.25-0.27 percent). The estimates for LMIC vary quite substantially. While UNCTAD (2022) estimates the financing gap in LMIC to be USD 1,237.8 billion (1.22 percent of 2022 World GDP) annually between 2020 and 2025, Kharas and McArthur (2019) report a value of USD 549 billion in 2025. Schmidt-Traub (2015) reports an estimate even lower: USD 157.5 billion are missing between 2016 and 2030 in LIC, and LMIC, according to their paper.

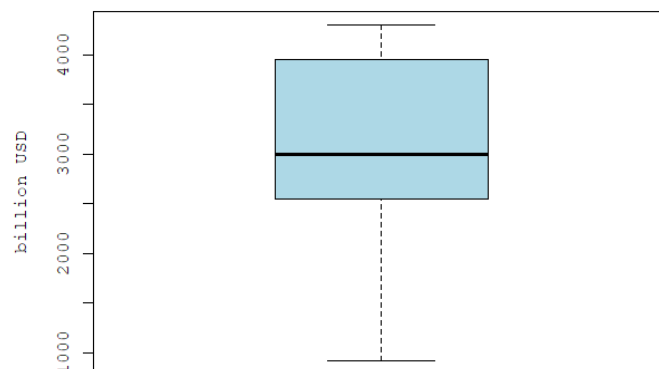


Figure 1: Annual financing gap in developing countries, 2015-2030

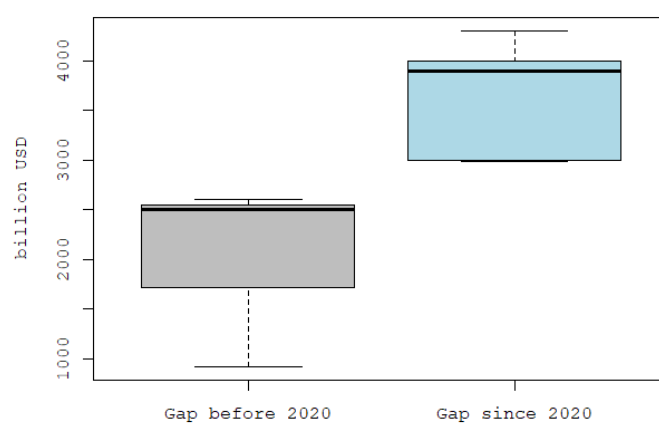


Figure 2: Annual financing gap in developing countries over time

	in billion USD	Time Period	Country Grouping	% of 2022 World GDP	% of 2022 country grouping GDP	% of 2022 advanced economies' GDP
UNCTAD (2014)	2,500	2015- 2030	developing countries	2.47%	6.38%	4.44%
UNCTAD (2023b)	4,000	2022- 2030	developing countries	3.95%	10.20%	7.10%
OECD (2022)	3,900	2020	developing countries	3.85%	9.95%	6.92%
	4,300	2020- 2025	developing countries	4.24%	10.97%	7.63%
UNCTAD (2022)	138.7	2020- 2025	LIC	0.14%	30.75%	0.25%
	1,237.8	2020- 2025	LMIC	1.22%	15.19%	2.20%
	1,612.3	2020- 2025	UMIC	1.59%	5.27%	2.86%
Gaspar et al. (2019)	2,600	2030	EME, LIDC	2.57%	6.14%	4.61%
	500	2030	LIDC	0.49%	18.91%	0.89%
	2,100	2030	EME	2.07%	5.29%	3.73%
Schmidt-Traub (2015)	157.5	2016- 2030	LIC,LMIC	0.16%	1.83%	0.28%
Sachs et al. (2019)	400	2019- 2030	LIDC	0.39%	15.13%	0.71%
Kharas and McArthur (2019)	922	2025	developing countries	0.91%	2.35%	1.64%
	150	2025	LIC	0.15%	33.26%	0.27%
	549	2025	LMIC	0.54%	6.74%	0.97%
	223	2025	UMIC	0.22%	0.73%	0.40%
Summers et al. (2023)	3,000	2023- 2030	developing countries (except China)	2.96%	14.12%	5.32%

Notes: The table shows the annual financing gap in USD billion and as % of 2022 World GDP, the country grouping GDP, and advanced economies' GDP. Whenever the financing gap was not available on an annual basis, we take the average value. If the paper provides a range of values, we take the midpoint.

Table 5: Annual financing gap

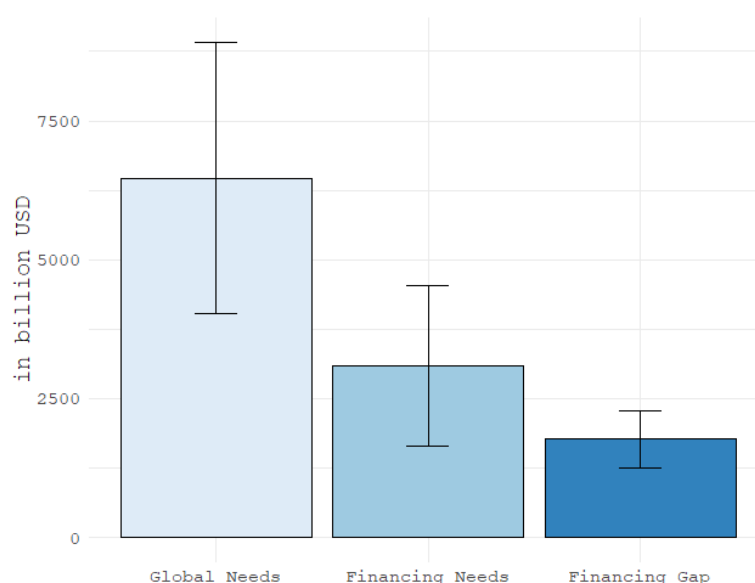
2.5 The role of Energy (SDG 7) and Climate Action (SDG 13)

In the following, we want to emphasize the role of affordable, clean energy and climate action in achieving the SDG agenda. The two goals are highly interconnected since without renewable forms of energy, climate neutrality will not be possible. We lay out financing needs and financing gaps for the Goals separately while emphasizing that it is often difficult to distinguish between the two. Whenever the financing needs for the Goals are not reported separately, we attempt to assign the needs according to the information provided. The upper bound for the annual financing gap for SDG 7 is USD 2.2 trillion while the average annual financing gap estimated is USD 1.7 trillion. For SDG 13, we find an upper

bound of USD 1.8 trillion which includes spending on energy. While the Goals are not mutually exclusive, the numbers make clear that a large fraction of the SDG financing gap of USD 4 trillion can be attributed to SDG 7 and SDG 13. Also, achieving SDG 7 and SDG 13 has implications for the success of other SDGs.

2.5.1 SDG 7 Affordable and Clean Energy

Achieving SDG 7 requires to ensure access to affordable, reliable, sustainable and modern energy for all. The targets include (1) ensuring universal access, (2) increasing substantially the share of renewable energy in the global energy mix, and (3) doubling the global rate of improvement in energy efficiency. The inclusion of a goal on sustainable energy and energy access in the SDGs addresses a significant gap in the MDGs which did not make any references to energy. The investment requirements for energy are substantial. In the following, we report the share of financing needs and gaps that can be attributed to energy from contributions mentioned in Section 2.1. We continue by introducing further literature that focuses specifically on energy spending.



Notes: The figure illustrates annual financing needs and gaps for SDG 7 Affordable and Clean Energy. The first bar displays global annual financing needs, the second bar displays financing needs in developing countries, and the third bar displays the financing gap in developing countries. Whenever only global estimates were available we assume that the needs for developing countries amount to 55% of the global estimate and the gap for developing countries amounts to 60% of the global estimate (UNCTAD, 2023b). The error bands show the standard deviation of the estimates.

Figure 3: Financing Gaps and Needs for SDG 7 Affordable and Clean Energy in developing countries

The International Energy Agency (IEA, 2023) estimates global investment needs for a transition to cleaner energy to reach USD 4.5 trillion per year by 2030. This would limit global warming to 1.5°C. In 2023, the IEA expected spending as high as USD 1.8 trillion in energy which leaves a gap of USD 2.7 trillion in 2023 to finance the 1.5°C goal in 2023.

UNCTAD (2023b) lists energy as one of the most relevant SDG sectors in deriving the financing gap for developing countries. The financing gap for energy in developing countries amounts to USD 2.2 trillion annually. While the energy sector comprises SDG 7 and SDG 13, most of the financing gap can be attributed to SDG 7. UNCTAD bases its analysis on estimates provided by IRENA (2022). They provide estimates on yearly global investment needs between 2021 and 2030. Accordingly, USD 5.7

trillion in energy investment is needed globally, with USD 1 trillion in fossil fuels and USD 4.7 trillion in clean energy. Given current investment of USD 1.1 trillion and USD 1 trillion, respectively, this results in an investment gap of USD 3.6 trillion. UNCTAD estimates the share of this gap for developing countries to lie between 60 and 70 percent, which generates an investment gap in developing countries of USD 2.2 trillion annually. Approximately USD 2.25 trillion will be necessary for energy-transition-related investments while fossil fuel investment needs to be reduced by USD 60 billion. Energy-transition-related investment includes renewable power generation (20 percent), grids and flexibility (10 percent), energy efficiency (52 percent), renewables end uses and district heat (6 percent), electrification (6 percent), and others including hydrogen-based fuels, bio-based fuels, and CSS (6 percent). The authors compare their IRENA-based estimate to McKinsey & Company (2022) and IEA (2022). McKinsey & Company (2022) estimates that total capital spending on physical assets necessary to achieve the transition to net zero globally is USD 9.2 trillion annually between 2021 and 2050. With current spending of USD 5.7 trillion, a financing gap of USD 3.5 trillion arises. The gap estimate is in line with UNCTAD calculations. IEA (2022) estimate the investment gap in clean energy for developing countries to be approximately USD 1.7 trillion which is around 20 percent lower than the UNCTAD estimate. According to IEA (2022), clean energy investment needs amount to annually USD 4.2 trillion, with current investment at USD 1.3 trillion. Developing countries account for 55 percent of global investment needs and 46 percent of current investment, which explains the gap of USD 1.7 trillion.

Schmidt-Traub (2015) focuses on different SDG investment areas. Among those sectors is investment in energy access and low-carbon power infrastructure. The investment needs in low and lower-middle-income countries for access to modern energy amount to USD 265-289 billion, on average, between 2015 and 2030. Including needs for related investment in climate mitigation and adaptation of USD 55-57 billion, the total average investment need amounts to USD 321-347, all in 2013 dollars. The spending concentrates on two subcategories: Access to electricity and clean cooking fuels, and power infrastructure.

Sachs et al. (2019) provide estimates for energy financing needs within the broad SDG sector on infrastructure. In low income countries, per capita cost (in 2019 dollars) related to energy are USD 30.4, or 3.9 percent of 2019 GDP. In lower-middle income countries, per capita costs are also USD 30.4, while this amounts to only 1.7 percent of GDP in this country grouping. In total, costs related to energy are USD 48.2 billion in 2019 and USD 57.8 billion in 2030 which is an average of USD 53 billion in energy spending between 2019 and 2030 (in 2019 prices).

Kharas and McArthur (2019) report estimates for 10 SDG related sectors where one sector is the energy sector. They draw their need assessment for energy from Rozenberg and Fay (2019) who present estimates targeting the provision of electricity access to 940 million people. Their "preferred" scenario proposes a substantial investment in renewable energy, emphasizing higher efficiency and a gradual expansion of access to encompass the entire population. Despite varying cost projections from different models based on decarbonization ambitions, the World Bank's overall finding is that opting for a low-carbon approach may not incur higher expenses than a business-as-usual trajectory for electrification. Kharas and McArthur (2019) adopt their "preferred" scenario to determine regional infrastructure spending requirements in the energy sector, encompassing both capital and maintenance costs, and calculate the corresponding public sector investment needs, assuming uniform public spending shares across regions. The estimated 2025 spending needs for energy per capita amount to USD 10 for low-income countries, USD 65 for lower-middle-income countries, and USD 327 for upper-middle-income countries. Across all developing countries, SDG spending needs on energy are approximately USD 164 per capita.

Songwe et al. (2022) consider financing for SDG 7 as part of financing for climate action. According to a literature review, they report financing needs of between USD 1.3 trillion and USD 1.7 trillion a year by 2030 for emerging economies and developing countries excluding China. The driving element of the energy transformation is the substantial and swift expansion of renewable energy. Accompanying the scale-up of renewables necessitates substantial complementary investments in public infrastructure for electricity systems. This includes the extension and enhancement of grids, backup capacity, storage, and the modernization and decarbonization of transport systems. Furthermore, enhancing energy productivity and reducing carbon emissions in energy end-use demands substantial private investments in industrial facilities, transportation fleets, and buildings. There is a growing potential for green hydrogen to replace fossil fuels in challenging contexts, emphasizing the need for investments in hydrogen production and distribution. Additionally, the early phase-out of coal may entail annual expenditures exceeding USD 50 billion. Further, Songwe et al. (2022) highlight the importance of ensuring a just transition for everyone across and within countries.

Figure 3 summarizes the financing needs for SDG 7. Global annual financing needs are estimated to be USD 6,466 billion on average. Thereof, USD 3,092 billion arise in developing countries. The financing gap is found to be USD 1,770 billion on average. Uncertainty regarding the estimates is quite high, which we highlight by including error bands that illustrate the standard deviation of the estimates. The uncertainty surrounding the estimates also stems from the fact that the papers include different goals in their analysis. Table 6 provides an overview on the areas, countries covered in the respective contributions as well as information on financing needs and gaps. To summarize, the estimated annual financing gap for SDG 7 for developing countries in the literature is on average about USD 1,770 billion while the upper bound for the financing gap is USD 2,200 billion annually by 2030.

	Areas	Financing Gap	Countries
IEA (2023)	Transition to cleaner energy to limit global warming to 1.5°C	Annual financing needs of USD 4.5 trillion annually by 2030, financing gap of USD 2.7 trillion in 2023	Globally
McKinsey & Company (2022)	Spending on physical assets necessary to achieve net zero	Financing needs of USD 9.2 trillion annually 2021-2050, financing gap of USD 3.5 trillion	Globally
UNCTAD (2023b) based on IRENA (2022)	Energy (SDG 7, SDG 13), focus on fossil fuel and clean energy investment	Annual global investment needs of USD 5.7 trillion between 2021-2030, Gap of USD 3.6 trillion, for developing countries: USD 2.2 trillion	Globally, developing countries
Schmidt-Traub (2015)	Energy access and low-carbon power infrastructure	Annual investment needs of USD 265-289 billion between 2015-2030	LIC, LMIC
Sachs et al. (2019)	Energy as part of infrastructure investment	Annual financing needs of USD 53 billion between 2019 and 2030	LIC, LMIC
Kharas and McArthur (2019)	Energy (provision of electricity)	USD 164 per capita in 2025 in developing countries (USD 10 in LIC, USD 65 in LMIC, USD 327 in UMIC)	LIC, LMIC, UMIC
Songwe et al. (2022)	Energy as part of climate action	Annual financing needs of USD 1.3 and 1.7 trillion by 2030	EME, developing countries other than China

Table 6: SDG Financing Gaps Estimates for Affordable and Clean Energy

2.5.2 SDG 13 Climate Action

The Sustainable Development Goal 13 demands countries to take urgent action to combat climate change and its impacts. It is necessary to reduce greenhouse gas emissions by 43% in 2030 and to net zero by 2050 worldwide. The stated targets are (1) to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters, (2) to integrate climate change measures into national policies, strategies and planning, (3) to improve education, awareness-raising and human and institutional capacity on mitigation, adaption, impact reduction and early warning. Investment needs in climate action are most often categorized in investment in climate adaptation and climate mitigation. While investments in mitigation aim at reducing greenhouse gas emissions, investment in adaptation tries to reduce the damaging impact of climate change. Below, we present the share of financing needs and gaps associated with climate action, drawing from the contributions outlined in Section 2.1. Subsequently, we delve into additional literature that specifically addresses expenditure on climate action.

UNCTAD (2014) provide estimates of investment needs and gaps for climate change adaptation and mitigation between 2015 and 2030. Investment in climate change mitigation aims to limit the rise in average global warming to 2° Celsius. The annualized total investment required for climate change mitigation (investment in relevant infrastructure, renewable energy generation, research and deployment of climate-friendly technologies etc.) amounts to USD 550-580 billion. Estimated current investment is USD 170 billion which leads to a investment gap of USD 380 to 680 billion annually. The range of estimates is wide since the investment needs depend crucially on the policies adopted. For climate change adaptation (investment to cope with the impact of climate change in agriculture, infrastructure, water management, coastal zones, etc.) annual investment needs are estimated to be USD 80-120 billion while USD 20 billion are currently invested annually. The investment gap is estimated to be USD 60-100 billion.

Unlike UNCTAD (2014), more recent publications by UNCTAD (see, for example, UNCTAD, 2023b and UNCTAD, 2023a) do not treat investment in climate action separately from investment in other SDGs. Combating climate change constitutes a wide-reaching challenge that concerns all SDGs. Other institutions (e.g. Schmidt-Traub, 2015) follow this approach as well to reduce overlapping and double counting. Climate action is part of the following SDG sectors: Energy, Water and Sanitation, Food and Agriculture, and Biodiversity. UNCTAD does not report a number referring to climate action in specific, therefore, it is not possible to differentiate the SDG financing gap regarding climate action from the overall gap. However, climate action is part of the two areas that constitute the highest share of the estimated financing gap: Energy, and Water and Sanitation. Therefore, a large share of the estimated financing gap of USD 4 trillion can be potentially contributed to climate action. As mentioned previously, UNCTAD uses a meta-analytical approach to provide estimates for SDG financing gaps. We summarize the estimates for the SDG sectors that incorporate climate action below. The financing gap for energy in developing countries amounts to USD 2.2 trillion annually. The energy sector comprises SDG 7 and SDG 13. As highlighted in Section 2.5.1, most of the financing gap in the SDG sector can be attributed to SDG 7. It is difficult to determine how much of the gap can be seen as gap in SDG 13. Next, we turn to the financing gap for Water and Sanitation (SDG 6). Financing needs are taken from Strong et al. (2020): USD 1.06 trillion globally and USD 740 billion for developing countries. Accounting for already available financing, this leaves an annual investment gap for water and sanitation of USD 487 billion annually for developing countries ⁶. The financing gap for Food and Agriculture is USD 273 billion

⁶According to Hutton and Varughese (2016), the investment gap in water and sanitation is about two thirds of the investment needs.

annually for developing countries ⁷. The gap widened relative to the 2015 estimate of USD 265 billion annually between 2016 and 2030 since the projected number of people suffering from hunger in 2030 increased from 650 million to 670 million. The annual financing gap for Biodiversity is USD 307 billion for developing countries ⁸. The SDG sector includes SDG 13, SDG 14, and SDG 15 and summarizes cost of capital investment in nature-based solutions (Nbs) such as marine protected areas, restoration of peatlands and salt marshes, as well as natural forest conservation. Next to capital investment the estimate also incorporates subsidies and biodiversity offsets. Globally, the gap in biodiversity ranges between USD 598 billion and USD 824 billion (UNEP, 2022; Deutz et al., 2020).

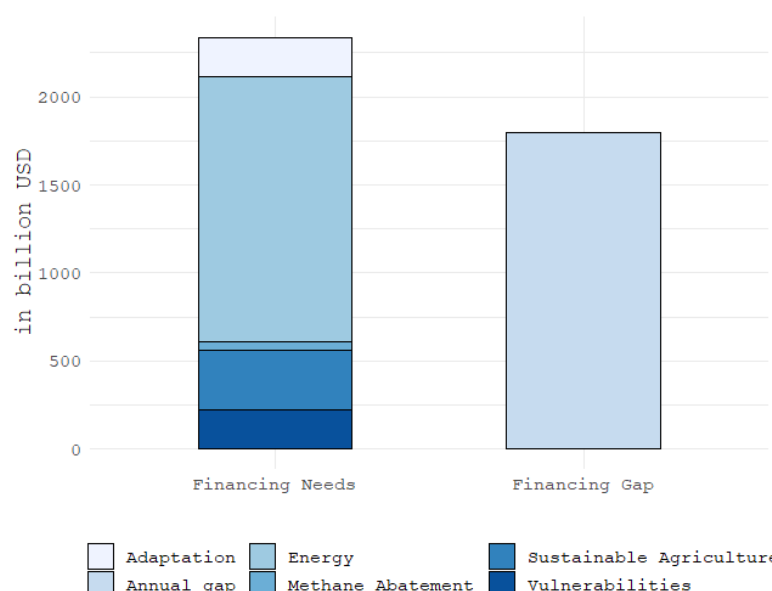
Schmidt-Traub (2015) integrate financing needs for climate action, foremost climate change adaptation and mitigation, into each SDG area. Among all SDG areas the investment needs for low- and lower-middle-income countries amount to USD 128-133 billion on average between 2015 and 2030 (in 2013 dollars). This corresponds to about 9 percent of total investment needs that can directly be contributed to climate change adaptation and mitigation. Thereof, USD 33-25 billion can be attributed to low-income countries and USD 95-98 billion to low-middle-income countries.

Sachs et al. (2019) claim that investment needs for climate adaptation and mitigation are part of the overall infrastructure needs for achieving the SDGs. However, they do not provide any numbers that can be attributed to climate action.

Next, we outline additional literature that focuses on financing needs and financing gaps for climate action. Songwe et al. (2022) see the investment and spending priorities related to climate action in the transformation of the energy system, responding to growing vulnerability of developing countries (investment in adaptation and resilience, funding of loss and damage), and investing in sustainable agriculture. The authors summarize the literature on investment and spending requirements for climate action. A large spending share can be attributed to the energy transformation where financing needs are estimated to lie between USD 1.3 trillion and USD 1.7 trillion a year by 2030 for emerging and developing countries other than China. More details can be found in Section 2.5.1. Financing needs for loss and damage which comprises the reaction to immediate impacts as well as reconstruction needs are reported to be between USD 150 billion and USD 300 billion by 2030. With respect to financing needs for adaptation they refer to UNEP (2016) and report financing needs between USD 200 billion and USD 250 billion annually by 2030. As highlighted below, UNEP has adjusted their estimates upward. Songwe et al. (2022) highlight the role of sustainable agriculture for mitigation, adaptation and development. Adding financing on protection and restoration of forests, other land use and marine ecosystems, and conservation of biodiversity, investment needs range from USD 275 billion to USD 400 billion per year by 2030. The authors further add methane abatement to the financing needs for climate action given its role in global warming. It ranges between USD 40 billion and USD 60 billion per year by 2030. Total investment needs amount to USD 2 trillion to USD 2.8 trillion per year by 2030. Climate and related investment in 2019 is reported to be USD 450 billion. The reported needs in 2030 are USD 2.2 trillion which leaves a financing gap of USD 1.8 trillion. Figure 4 illustrates the financing gap and needs as reported by Songwe et al. (2022). The estimated needs sum up to USD 2,337 billion while the gap is USD 1,800 billion. We include the estimates by Songwe et al. to emphasize that most financing needs, about 65 percent, in climate action relate to energy. This highlights the strong interconnectedness of SDG 7 and SDG 13. The estimate includes both needs in mitigation and adaptation. If we exclude financing needs related to energy, the remaining financing needs are USD 837 billion.

⁷Based on FAO, IFAD and WFP (2015) and FAO, IFAD, UNICEF, WFP and WHO (2022).

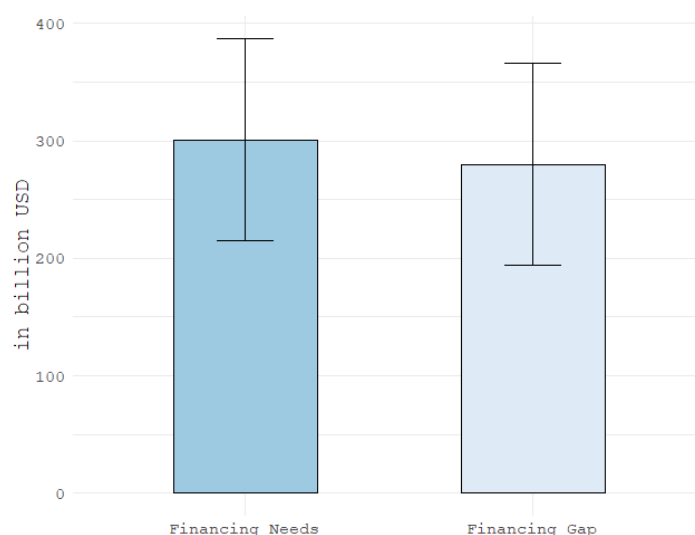
⁸Based on UNEP (2022).



Notes: The figure displays the estimates of financing needs and the financing gap for climate action according to Songwe et al. (2022).

Figure 4: Financing SDG 13 Climate Action in developing countries

UNEP (2023) choose a sectoral approach to estimate the costs of adaptation by consulting sector models and studies. It reports adaptation costs in the following sectors: coastal zones, river floods, infrastructure, agriculture, fisheries and aquaculture and marine ecosystems, health, early warning and social protection, terrestrial biodiversity and ecosystem services, cooling demand labour productivity, business and industry, capacity-building and governance, socially contingent effects. The annual adaptation finance needs/ adaptation costs for developing countries are estimated to range between USD 215 billion and USD 387 billion until 2030. The estimates are illustrated in Figure 5. This is equivalent to 0.6 percent to 1 percent of GDP for all developing countries. Relative to GDP, adaptation costs are estimated to be highest for low-income countries (3.5 percent), followed by lower-middle (0.7 percent) and upper-middle (0.5 percent). UNEP (2023) argues that estimates for adaptation needs vary substantially due to differences in objectives, uncertainty, coverage and boundaries, as well as methodological issues and assumptions. Compared to an earlier UNEP adaptation gap report, which estimates a range between USD 170 billion and USD 240 billion, the estimates increased significantly (UNEP, 2016). The authors further compare their study to an earlier study (World Bank, 2010; Narain et al., 2011) that used a comparable sectoral modeling approach. The study estimates the costs of adaptation for developing countries to be around USD 70 to USD 100 billion per year for the period 2010–2050, based on 2005 prices. In 2021 prices, this translates to USD 125 to USD 171 billion per year. Notably, the present update employs the same modeling frameworks for sectoral analysis, specifically in coastal, river floods, and agriculture. Despite this commonality, the estimated costs in the current update are significantly higher. UNEP (2023) attributes this discrepancy to the more adverse climate change impacts documented in the literature. Additionally, the elevated cost projections may stem from updates to the level of adaptation costs and the incorporation of new risks and sectors into the analysis. Turning to financing for climate adaptation needs, UNEP (2023) summarizes climate-specific international public finance commitments towards developing countries. Between 2017 and 2021 those aggregated to well below USD 70 billion per year out of which approximately USD 30 billion were targeted at adaptation. An upward trend could be observed until the pandemic. The largest part of the financing stems from domestic revenues. To



Notes: The figure displays the estimates of financing needs and the financing gap for adaptation according to UNEP (2023).

Figure 5: Financing SDG 13 Climate Action in developing countries: Adaptation

obtain an estimate for the financing gap, the authors compare the needs to global public finance flows to adaptation in 2021, which were USD 21 billion. The estimated gap ranges between USD 194 billion and USD 366 billion per year which is about 10-18 times of current flows.

The CPI estimates that in an average scenario, the annual global financing needs for climate action will increase steadily from USD 8.1 trillion to USD 9 trillion through 2030 (CPI, 2023). From 2031 until 2050, the financing needs increase to USD 10 trillion annually. The largest spending area is mitigation which received 91 percent of the total financing flows in 2021/2022. Two thirds went into the energy and transport sectors. Spending in adaptation while decreasing in its relative share, increased by 29 percent in 2021/2022 to USD 63 billion. Increasing adaptation financing is necessary given that in developing countries alone estimated needs are USD 212 billion per year by 2030. Annually, financing flows amount to approximately USD 1.3 trillion in 2021/2022. Most of the funds went to China, the United States, Europe, Brazil, Japan, and India. Private actors provided 49 percent of total climate finance.

Table 7 provides an overview of the financing gaps provided in the literature. Financing needs for climate action are often reported as financing needs for climate adaptation and/or climate mitigation. What is most striking is that financing needs reported in the literature have increased significantly since the announcement of the SDG agenda. While early contributions (UNCTAD, 2014; Schmidt-Traub, 2015) report annual financing needs with an upper limit of USD 133 billion, more recent work (UNCTAD, 2023b; Songwe et al., 2022) estimate annual financing needs of up to USD 2.8 trillion. The estimates are driven by financing needs in the energy sector. In Songwe et al. (2022), financing needs for energy are 65 percent of total financing needs for climate action. If we exclude spending on energy, the remaining financing needs are USD 837 billion, including spending on adaptation, sustainable agriculture, methane abatement, and vulnerabilities. UNEP (2023) estimate financing needs for climate adaptation only. The needs lie between USD 215 billion and USD 387 billion annually, which suggests that the largest part of financing needs for climate action can be contributed to mitigation. The upper bound for the annual financing gap for climate action is USD 1.8 trillion which, however, includes spending on energy. Looking only at climate adaptation, the estimated annual gap is USD 194-366 billion.

	Areas	Financing Gap	Countries
UNCTAD (2014)	Climate adaptation and mitigation	Annual needs: USD 630-700 billion, annual gap: USD 440-780 billion. Mitigation: annual needs of USD 550-580 billion, current spending of USD 170 billion, gap of USD 380-680 billion. Adaptation: annual needs of USD 80-120 billion, current spending of USD 20 billion, gap of USD 60-100 billion.	Developing countries
UNCTAD (2023b)	Financing needs for climate action integrated into the following SDG sectors: Energy, Water and Sanitation, Food and Agriculture, Biodiversity	Financing Gap of USD 3267 billion: Energy of USD 2200 billion, Water and Sanitation of USD 487 billion, Food and Agriculture of USD 273 billion, Biodiversity of USD 307 billion	Developing countries
Schmidt-Traub (2015)	Financing needs for climate action integrated in all SDG sectors	Annual financing need of USD 128-133 billion (in 2013 dollars) between 2015-2030, financing gap of between 10-12 percent of needs	low-income and lower-middle-income countries (World Bank classification)
Songwe et al. (2022)	Transformation of the energy system, responding to growing vulnerabilities (investment in adaptation, resilience, funding of loss and damage), sustainable agriculture	Annual needs of USD 2-2.8 trillion by 2030: USD 1.3-1.7 trillion in energy, USD 150-300 billion in vulnerabilities, USD 200-250 billion in adaptation, USD 275-400 billion in sustainable agriculture, USD 40-60 billion in methane abatement. Annual financing gap of USD 1.8 trillion	Emerging economies and developing countries except China
UNEP (2023)	Climate adaptation	Financing needs of USD 215-387 billion yearly, financing gap of USD 194-366 billion yearly	Developing countries
CPI (2023)	Climate adaptation and mitigation	Annual needs of USD 8.1 - 10 trillion until 2050	Global

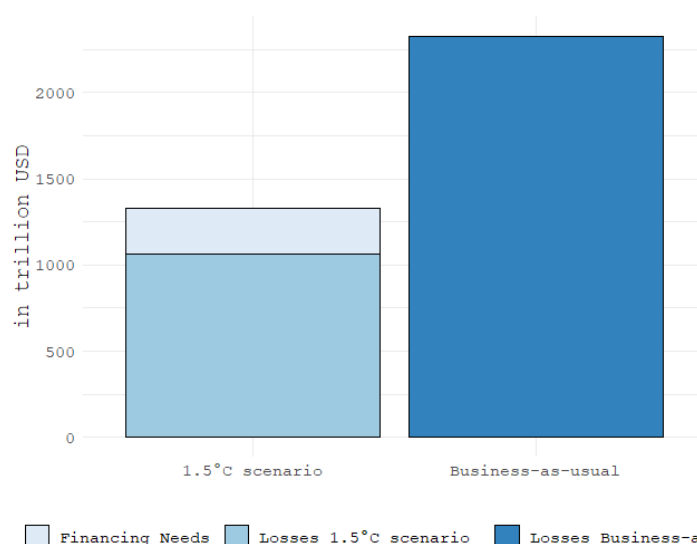
Table 7: SDG Financing Gaps Estimates for Climate Action

2.5.3 Costs of Inaction

Financing needs for the SDGs summarize the costs associated with actions to achieve economic, social and environmental priorities around the world. Importantly, also inaction, especially regarding progress in combating climate change, generates costs. In the following, we summarize the most important contributions with respect to inaction to highlight the importance of the SDG agenda but also to deepen the understanding of the order of magnitude of financing needs. Studies on costs of inaction are mostly concerned with climate inaction and estimates are provided globally.

In a recent contribution, the CPI estimates the cumulative cost of inaction between 2025 and 2100 at USD 1,266 trillion globally (CPI, 2024). The authors compare the 1.5°C scenario with a business-as-usual scenario. Achieving the 1.5°C scenario requires financing of cumulatively USD 266 trillion. In the 1.5°C scenario, losses between 2025 and 2100 amount to USD 1,062 trillion while in the business-as-usual scenario the losses amount to USD 2,328 trillion. Thus, investing into climate action decreases the losses by USD 1,266 trillion. Importantly, the above estimates are at a global level which makes it difficult to compare them to the financing needs and financing gaps summarized in this report. The authors group the costs of inaction among two categories: Economic costs and social costs. Economic costs are direct economic losses that arise due to climate-related risks and impacts (e.g. impact on productivity, damages to assets and capital, global flow of currency). Social costs are indirect costs associated with the climate-related impact on people and their environment (health and well-being, loss of nature and biodiversity, conflict and migration, global and local inequalities).

We illustrate the costs of inaction according to CPI (2024) in Figure 6. We sum up the financing needs for reaching a 1.5°C scenario and the losses associated with the scenario. The costs associated with boosting the SDGs sum up to USD 1,328 trillion over 2025 and 2100. The business-as-usual scenario will, on the other hand, lead to losses as high as USD 2,328 billion. Therefore, we estimate the cost of inaction at USD 1,000 trillion.



Notes: The figure illustrates cumulative financing needs and costs between 2025 and 2100 in trillion USD. The left bar displays the costs and losses in case of the 1.5°C scenario. The right bar displays the losses that would occur in a business-as-usual scenario. The difference between the two estimates are considered costs of inaction. The numbers are according to CPI (2024).

Figure 6: Costs of Inaction

Swiss Re Institute (2021) simulate economic and social losses from rising temperatures in percent of GDP and relative to a world without climate change by 2050. The report compares different scenarios:

well-below 2°C, 2°C, 2.6°C, and a severe case of 3.2°C. The authors use a large structural macroeconomic model to estimate the costs of inaction and find that worldwide while the well below 2°C target would induce GDP losses relative to a world without climate change of 4.2 percent, the losses increase to 11/13.9/18.1 percent for the other scenarios, respectively. The study does not account for global and local inequalities.

Another comprehensive study by Deloitte, reports a scenario where global average temperatures rise by 3°C until the end of the century (Deloitte, 2022). The paper computes economic costs and costs related to health and well-being. By estimating a computable general equilibrium model, they find that in that scenario the aggregate global economic losses between 2021 and 2070 sum up to USD 178 trillion. This implies a decrease in GDP in 2070 of 7.6 percent. While the estimate does not include loss of nature and biodiversity as well as conflict and migration costs, the estimates are still low compared to the other studies.

The above papers offer a wide range of estimates for costs of inaction. The estimates depend on differences in costs, warming scenarios, and time frames. Since estimates of inaction are many times global estimates and refer to inaction regarding climate only, it is difficult to compare the costs of inaction to our estimates of SDG financing needs. CPI (2024) compare their loss estimate to financing needs. Reaching a 1.5°C scenario would require financing as large as USD 266 trillion between 2025 and 2050 globally to avoid losses as large as USD 1,266 trillion. Therefore, globally USD 1000 trillion could be saved if investment in climate action starts now.

3 Approaches to close financing gaps

3.1 Domestic public investment in SDGs

Domestic revenue plays a significant role in financing SDG needs. For instance, Gaspar et al. (2019) estimates that if countries increase their tax revenue, it could cover about 32 percent of additional spending requirements in 2030. Most emerging economies would be able to finance the SDG agenda purely relying on their own resources. For low-income developing countries, additional mobilization of taxes might not be sufficient to achieve the SDGs, but still highly beneficial.

The 2019 paper argues that significant potential exists for increasing government revenue in many emerging market economies and low-income developing countries. Noteworthy progress has been achieved in enhancing tax-to-GDP ratios, particularly evident in low-income developing countries where tax revenue has risen from approximately 12 percent of GDP in the early 2000s to nearly 15 percent at the time the paper was published. This lies within the benchmark of 15 to 20 percent proposed by UNCTAD (2022) to achieve the SDG agenda. However, variations in tax revenue persist across countries, generally aligning with GDP per capita. At the median, tax revenue constitutes 15 percent of GDP in low-income developing countries, 18 percent in emerging market economies, and 26 percent in advanced economies. Notably, about one-third of emerging market economies and half of low-income developing countries exhibit tax-to-GDP ratios below 13 percent, a threshold identified as a tipping point for development (Gaspar et al., 2016 in Gaspar et al., 2019).

Gaspar et al. (2019) propose that countries increase the tax-to-GDP ratio by 5 percentage points within the next decade, which they argue is an ambitious but reasonable goal. This can be achieved by a combination of tax and spending reforms and administration efforts. Tax policies can be improved by eliminating tax incentives and exemptions that impair the efficiency, equity, neutrality, and simplicity of the system, or by increasing compliance (Benedek et al., 2021). Increasing compliance can raise efficiency and reduce the shadow economy. Countries can further improve the management of public sector assets, e.g. the management of state-owned enterprises to earn higher returns (Benedek et al., 2021). It is further pivotal to address inefficiencies in spending.

Benedek et al. (2021) who account for the effect of the pandemic on SDG spending needs, update the goal of raising tax-to-GDP ratios to 3-7 percentage points. As argued above, increasing tax revenue should be sufficient to close the gap in most emerging market economies. For low-income developing economies, however, the mobilization of taxes alone may not be adequate to finance the ambitious SDG agenda. In this case, additional spending requirements in low-income developing countries in 2030, net of the tax increase, amount to USD 358 billion, equivalent to 0.3 percent of global GDP (Gaspar et al., 2019).

Domestic revenue largely depends on economic growth and the responsiveness of tax revenue to the latter. Kharas and McArthur (2019) estimate the contribution of an additional percent increase in domestic revenues mobilization. According to their estimates, domestic revenues can contribute an additional USD 6 billion in low-income countries, USD 97 billion in lower-middle-income countries, and USD 60 billion in upper-middle-income countries. This corresponds to 4 percent, 17 percent, 26 percent of the SDG financing gaps in the respective country groupings in 2025 highlighting again the difficulties in low-income countries in raising domestic revenue. The aggregate gap in developing countries would decrease by USD 163 billion. Unfortunately, due to the pandemic, many countries have seen low levels of economic growth as argued in Section 2.3.

3.2 Private investment in SDGs

Next, we summarize the role of the private sector in achieving the SDG agenda. The private sector is responsible for 90 percent of jobs and 60 percent of all investment (IMF, 2023; IFC, 2013). Private investment increases labor productivity and wage growth which in turn accelerates development (IMF, 2018). Governments in low-income developing aim at increasing private finance which has shown to raise efficiency and enhance risk sharing. Often, domestic private finance options are small given low savings in low-income developing countries. Private finance from abroad would be necessary which, however, has been below desired levels (Benedek et al., 2021).

The potential for increasing private sector participation varies quite substantially across sectors. Infrastructure investments (energy, climate change or mitigation, transport, water, sanitation), for example, are attractive for private investors while sectors like education or healthcare are less likely to attract private investors. In those sectors, the risk-return relationship is not attractive to investors or the investment needs fall under public sector responsibilities more broadly. Table 8 gives an overview on the average private sector participation in investment in 2015 in developing countries and compares it to the private investment share in developed countries. This provides a benchmark for the possible scope of private investment in financing the SDG agenda. Schmidt-Traub (2015) summarize private financing opportunities for the eight investment sectors covered in their study and highlight the role of private financing for energy, transport, and telecommunication⁹.

Business activity is profit-driven (United Nations, 2023). The private sector aims at investing in well-compensated risks as opposed to the highest returning asset. It will ask a high premium for risky projects while underinvesting in public goals that underperform relative to other investments. Governments can increase private sector participation by creating a favourable environment. Macroeconomic and sociopolitical conditions are important factors determining credit risk and therefore, foreign investment. Governments have to establish strong institutions and governance to facilitate such investments. The public sector can also directly support investment by starting public-private partnerships. There is a strong emphasis on sustainable industrial policies to help stimulate investment and business activity aligned with the SDGs. Summers et al. (2023) highlight the role of multilateral development banks (MDBs) in attracting the private sector. The core of their SDG strategies should be the mobilization and catalyzation of private capital. MDBs should support governments in reducing policy and regulatory risk and adjust financial product offerings such that they close private capital market gaps. The largest players are the International Finance Corporation (IFC), the European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB), and the African Development Bank (AfDB). While mobilization by bilateral providers is small in comparison, development finance institutions (DFIs) in the United States, France and the United Kingdom are still important for financing SDGs in developing countries (OECD, 2023). Guarantees, syndicated loans, and project finance are key in securing private

⁹The private sector plays a major role in health service delivery. Private investments account for around 20 percent of health expenditure. Education sees private household spending reaching up to 30 percent, e.g. by private schools gaining prominence. Public financing remains crucial for universal access in health and education. Agriculture and food security require about 60 percent public financing. In the energy sector, private investment historically covers 43-47 percent of the power sector. While large-scale infrastructure attracts private investment, achieving universal access to electricity in rural areas may need public financing. Household financing is important for water and sanitation, but low-income households may struggle to cover full connection costs. The private sector's current share is 7 percent, with estimates suggest it could reach up to 20 percent. For transport, the private sector is estimated to cover 52-57 percent of total costs. In telecommunications, the private sector may contribute 54-86 percent of total telecommunication costs. Private financing for ecosystems and biodiversity is limited, with an estimated 85 percent of investment needs requiring public financing. Social transfers and data for SDGs requires mostly public funding.

finance while perceived high risk, low level of returns, a lack of project pipelines and financial innovations are challenging factors for mobilization (OECD, 2023). Another potential avenue is the mobilization of institutional investors such as pension funds or insurance companies.

UNCTAD (2014) reports the funding possibilities for the annual investment gap of USD 2.5 trillion. In the "business as usual" scenario, the private sector contribution would amount to USD 0.9 trillion, leaving USD 1.6 trillion to be covered by the public sector, including ODA. If, however, developing countries could increase the share of private sector investment to levels observed in developed countries (as reported in Table 8), it could raise private sector contribution to USD 1.8 trillion leaving a gap of 0.7 trillion for public investment. UNCTAD argues that a doubling of the growth rate of private investment would be desirable to minimize pressure on the public sector.

International private investment in the SDGs has increased since this seminal work. UNCTAD (2023b) report the change in number of projects between 2015 and 2022. Infrastructure (+ 16 percent), renewable energy (+ 21 percent), water and sanitation (+ 13 percent), and health and education (+ 11 percent) have seen increasing numbers of projects. The number of projects that relate to agrifood systems, however, declined by 19 percent. Overall, private finance, SDG-relevant greenfield investment and international project finance combined, in developing countries increased by USD 181 billion between 2015 and 2022 (from USD 290 billion to USD 471 billion). Summers et al. (2023) report a similar goal for private financing. According to their analysis, USD 740 billion annually are necessary to reach the SDG agenda. This is USD 500 billion above 2019 levels. Most of the SDG-related private investment would be investment in infrastructure, foremost in energy, sustainable agriculture, and building efficiency. Traeger et al. (2021) focus on least developed countries (LDC). In LDC, the average share of private financing in SDG investment was 75 percent during 2017–2020. The share of private sources is expected to stay large. Private investment will need to approximately double from USD 457 billion in 2017 to USD 1,050 billion in 2030. Public investment will need to increase from USD 152 billion to USD 257 billion. Public-private partnerships play a minor role in LDC. They will have to contribute USD 12.4 billion (compared to USD 5.2 billion in 2017). Also, private investment in least developed countries has not yet recovered from the pandemic. The number as well as the value of projects have been declining since 2020 (UNCTAD, 2023b).

OECD (2023) focus on private financing mobilized by official development interventions. Private finance is mostly mobilized within developing countries with lower risk profiles and in projects related to economic infrastructure and services, i.e., within middle-income countries and in transport and storage, communications, energy, and banking and business services. The second largest share went into the industry, mining and construction sectors. Mobilized private financing was much smaller in social sectors such as health or education. Mobilization of private finance was low in low-income countries. Mobilized finance went predominantly into SDG 8 (decent work and economic growth), SDG 10 (reduced inequalities), and SDG 9 (industry, innovation and infrastructure). The largest share of mobilized private finance went into climate action, mostly climate mitigation. Further, mobilizing finance from institutional investors such as pension funds or insurance companies would be very fruitful in reducing the financing gap. Closing an estimated gap of USD 3.9 trillion would require institutional investors to only shift 3.9 percent of their 2019 assets towards the SDG agenda.

	Developing countries	Developed countries
Power	40-50	80-100
Transport	30-40	60-80
Telecommunications	40-80	60-100
Water and sanitation	0-20	20-80
Food security and agriculture	75	90
Climate change mitigation	40	90
Climate change adaptation	0-20	0-20
Health	20	40
Education	15	0-20

Table 8: Average private sector participation in investment in 2015 in %, Source: UNCTAD (2014)

3.3 Financing SDG 7 Affordable and Clean Energy and SDG 13 Climate Action

In the next section, we summarize the role of public and private participation in financing SDG 7 Affordable and Clean Energy and SDG 13 Climate Action. It is difficult to differentiate between financing for SDG 7 and SDG 13 given their strong interconnectedness.

In financing SDG 13, we have to differentiate between private sector participation in mitigation and adaptation. While private sector participation in mitigation is generally high, it is low in adaptation. At the initiation of the SDG agenda, private sector participation in developing countries was at 40 percent compared to 90 percent in developed countries. In adaptation, both developed and developing countries had a private share of 0-20 percent (UNCTAD, 2014). Investments in adaptation are largely financed by the public sector. It has proven challenging to mobilise private finance for adaptation. Investments in adaptation do not offer attractive financial returns and are difficult to scale up, which is important for private investors. Mitigation, however, is more profitable and scaleable and attracts private financing (OECD, 2023). Overall, most climate finance goes into mitigation efforts. CPI (2023) estimate the share going into mitigation efforts at 91 percent in 2021/22 .

The CPI offers a comprehensive overview of global climate finance flows (CPI, 2023). In 2021/2022 those amounted to USD 1.3 trillion (1 percent of global GDP). Globally, climate finance is equally split between private (funds, institutional investors, households, corporations, commercial finance institutions) and public actors (public funds, export credit agencies, multilateral climate funds, bilateral and multilateral and national DFIs, state-owned finance institutions, governments). The largest share of private finance can be found in developed economies and is financed by commercial finance institutions in the form of debt.

USD 30 billion (approximately 2 percent) of global climate finance went to LDC while USD 179 billion (approximately 14 percent) went to EMDEs excluding China. Only USD 23 billion (less than 2 percent) of climate finance went into the ten countries¹⁰ most affected by climate change. The UNFCCC estimates that financing flows to developing countries in 2019/2020 were USD 803 billion which is about on third of the annual investment needed (UNFCCC, 2022). According to the authors, this constitutes a 12 percent increase relative to 2017/18 which was mostly used to increase energy efficiency in buildings (USD 34 billion increase), sustainable transport (USD 28 billion increase) and adaptation finance (USD 20 billion increase). Investment in clean energy remained relatively stable, which can be explained by a decline in clean energy project costs. One reason for higher financing related to climate action was that

¹⁰CPI (2023): Puerto Rico, Myanmar, Haiti, Philippines, Mozambique, The Bahamas, Bangladesh, Pakistan, Thailand, Nepal

many countries allocated part of their pandemic recovery package to climate action. Among developing countries this happened foremost in Asia. Further, public finance flows from developed to developing countries increased.

To obtain an understanding of where financing for developing countries comes from, we summarize sources in 2020 as stated in UNFCCC (2022). Multilateral climate funds account for USD 3.5 billion. MDBs provided USD 45 billion to developing and emerging economies. Private climate finance in developing countries, which was mobilized from developed countries by bilateral providers accounted for 5.1 billion.

Mobilised private finance in energy projects (which was mostly targeted at climate change mitigation and adaptation) was, on average, USD 13.8 billion annually in 2018-20 (OECD, 2023). Thereof, 90 percent were mobilised through guarantees, syndicated loans, direct investment in companies and SPVs. The renewable energy sector mobilised USD 101 billion in FDI in 2020.

3.4 The role of global efforts

Domestic reforms in the public and private sector alone are not sufficient to achieve the SDG agenda by 2030 in developing countries. International efforts are indispensable. In a report issued by the UN in 2023 (United Nations, 2023), the imperative for enhanced international collaboration to alleviate the enduring impact of numerous crises and facilitate a sustainable recovery is emphasized. Global policy initiatives should address the diverse challenges encountered by developing countries. Initiatives should address spillovers from policies of developed countries, risks of debt distress, provide assistance to individuals affected by crises and hunger, and augment investments in the SDGs, foremost climate action.

In the following, we aim to provide a benchmark for international efforts necessary to achieve the SDG agenda. While some countries can rely on domestic revenue from the private and public sectors, others have to rely strongly on external public financing, depending on their level of development. Additional resources can be generated by increasing official development assistance (ODA), or aid, and non-concessional borrowing from official development institutions. While ODA accounted for below 10 percent of external sources in developing and transition economies, it accounted for almost 40 percent in least developed countries (UNCTAD, 2014). Schmidt-Traub (2015) derive an external financing gap of USD 152-163 billion annually after accounting for increases in (public and private) domestic resource mobilization. This is equivalent to 0.22-0.26 percent of high-income countries' GDP. The gap can be addressed by international public finance, including Official Development Assistance. Increasing ODA can help to close the financing gap. For instance, Kharas and McArthur (2019) find that while the financing gap for low-income countries is quite substantial relative to their GDP, it corresponds approximately to levels of total ODA. Thus, doubling the ODA could potentially cover the gap in SDG needs for low-income countries. Benedek et al. (2021) argue that increasing official aid to the UN target of 0.7 percent of GNI would largely cover the financing gap in low-income countries. However, aid would need to be directed towards the SDG sectors. The recent crises have shown that an expansion of ODA is possible as it increased to a record level of USD 204 billion in 2022, much for humanitarian need associated with the war in Ukraine (Summers et al., 2023). They further emphasize the role of official non-concessional finance. Given the high share of debt needed for sustainable infrastructure investments, access at affordable rates is critical. Kharas and McArthur (2019) further highlight borrowing decisions in closing the financing gap. While mobilizing non-concessional resources at market prices was attractive within past years given low levels of real interest rates, the current environment of rising interest rates makes borrowing difficult

as highlighted in Section 2.3. Even before, many developing nations confronted elevated risk premia and short maturities in private capital markets, potentially rendering such borrowing unattractive. There is an ever increasing important role for official bilateral or multilateral financial institutions to provide more favorable terms than the market. Those could be accompanied by guarantees or other risk mitigation measures. Additionally, these resources could be directed towards projects, particularly in infrastructure, where risk is mitigated through the involvement of official lending institutions (Kharas and McArthur, 2019). According to OECD (2022), a shift of 1 percent of public and private financial global assets would suffice to close the SDG financing gap. Summers et al. (2023) suggest that accounting for (public and private) domestic resource mobilization, USD 1 trillion out of USD 3 trillion financing gap have to be provided internationally. Annually, USD 500 billion thereof should come from the international development finance system until 2030. One-third of the USD 500 billion would be concessional funds and non-debt-creating financing, while the other two-thirds would be non-concessional official lending. They highlight the role of MDBs. MDBs should provide USD 260 billion annually (USD 200 billion non-concessional lending) and help with private finance mobilisation to match this amount. Importantly, the above is additional spending relative to the base year 2019 when private and official international flows amounted to USD 580 billion. Therefore, almost a tripling of international finance flows is necessary according to their estimations.

4 Summary of results

The Addis Ababa Action Agenda comprises seven action areas to help finance the SDG agenda: domestic public resources, domestic and international private business and finance, international development cooperation, international trade as engine for development, debt and debt sustainability, addressing systemic issues, science, technology, innovation and capacity-building. We have discussed domestic public and private revenue and international efforts in closing the financing gap. Further, we have highlighted how governments and international actors can foster private investment in the SDGs. In the following, we summarize the approaches to close the SDG financing gap and attempt to propose different avenues for closing the gaps. We want to highlight, however, that those attempts can be considered as thought experiments as our analysis has shown that there is large uncertainty regarding the estimates of financing gaps and financing needs. Table 10 summarizes our attempts.

We estimate the average annual financing gap at USD 4,000 billion for developing countries. This equals 10.2 percent of developing countries' GDP, 3.95 percent of the World's GDP and 7.1 percent of advanced economies' GDP in 2022. Our focus is on how SDG 7 (Clean and Affordable Energy) and SDG 13 (Climate Action) contribute to the financing gap. It is important to highlight the interconnectedness of the two Goals, which makes it potentially difficult to divide the estimates. We find upper bounds of the financing gaps for SDG 7 and SDG 13 of USD 2.2 trillion and USD 1.8 trillion, respectively. While the Goals are not mutually exclusive, together they potentially comprise the largest share of the USD 4 trillion financing gap which emphasizes the role of climate finance.

First, we highlight the role of domestic public revenue. There is broad consensus that increasing the tax-to-GDP ratio is crucial in achieving the SDG agenda. UNCTAD (2022) set a benchmark of 15 to 20 percent of GDP. Others argue that the ratio should be increased between 3 and 7 percentage points (Gaspar et al., 2016; Benedek et al., 2021). For emerging economies, raising tax revenues is argued to be sufficient to achieve the SDG agenda. Low-income developing countries would, however, need

additional financing to close the gap.

Gaspar et al. (2019) attribute approximately 19 percent of the financing gap to LIDC. Based on our estimate of USD 4 trillion, the financing gap for LIDC would be approximately USD 760 billion. Sachs et al. (2019) who account already for an increase in government revenues to GDP in order of 5 percentage points, estimate a financing gap in LIDC of USD 400 billion. The authors further assume that ODA continues as a constant fraction of GNI of donor countries. GNI is assumed to grow by 2 percent annually. The IMF classification of LIDC includes all countries classified by the World Bank as LIC as well as a subset of LMIC. The financing gap of LIC identified in our literature analysis lies between USD 138 billion and USD 150 billion. The literature is less in agreement about the financing gap in LMIC which is reported at USD 549 billion in Kharas and McArthur (2019) and USD 1,237.8 in UNCTAD (2023b).

We continue with an exercise to highlight the contribution to closing the financing gap by increasing the tax-to-GDP ratio. Table 9 summarizes our results. We use data on tax revenue as percentage of GDP and current GDP to derive by how much tax revenue would change if we were to increase the tax-to-GDP ratio. We use the latest available data from the World Bank and define low and middle-income countries according to the World Bank classification¹¹. Between 2005 and 2021, the tax-to-GDP ratio was between 10 and 12 percent in low and middle-income countries. In 2021, it stood at 10.88 percent while tax revenue was USD 4,028 billion. We want to highlight that this is a mere thought experiment that abstracts from any additional shocks to the economy and assumes that all additional tax revenue is used for the SDG agenda. Also, we assume that countries increase tax-to-GDP ratios by 1-7 percentage points on average. If countries were to increase the ratio by 3 percentage points, additional revenue in 2021 would be USD 1,110 billion and therefore, close about 27% of the financing gap. If countries were to increase the ratio by 7 percentage points which would imply a tax-to-GDP ratio of on average 17.88, 64.5% of the financing gap could be closed. A gap of USD 1,410 billion would remain for developing countries overall.

Increase tax-to-GDP ratio in percentage points	Additional tax revenue in 2021	In % of the financing gap of USD 4000 billion
by 1 p.p.	USD 370 billion	9.2%
by 2 p.p.	USD 740 billion	18.5%
by 3 p.p.	USD 1,110 billion	27.8%
by 4 p.p.	USD 1,480 billion	37.0%
by 5 p.p.	USD 1,850 billion	46.3%
by 6 p.p.	USD 2,200 billion	55.0%
by 7 p.p.	USD 2,590 billion	64.8%

Notes: We use data from the World Bank. All estimates are for low and middle income countries as classified by the World Bank. Additional tax revenue is relative to actual tax revenue in 2021.

Table 9: Financing the SDG agenda: Increasing tax-to-GDP ratios in low and middle income countries

On the one hand, the remaining gap in LIDC can be closed by mobilising additional (domestic or international) private capital. Private sector participation is still low in many sectors in developing countries compared to developed economies. The potential of increasing private sector participation crucially depends on the sector. Private investment could potentially cover around 70 percent of the financing gap if developing countries were to increase private sector participation to levels seen in developed countries

¹¹The World Bank classifies countries as low and middle-income countries when GNI per capita was less than USD 13,845 in 2022.

(UNCTAD, 2014). Participation is especially relevant for investments in infrastructure such as energy, climate mitigation, transport, or telecommunication. Those sectors have proven to be of interest for investors. If developing countries could increase private sector participation accordingly, a financing gap of USD 1,200 billion would remain in our exercise (see Table 10).

On the other hand, we would like to emphasize the role of global conditions. The Covid-19 pandemic has proven that global conditions do affect the financing of achievement of the SDG agenda. The financing gap increased by over 50 percent according to a study by the OECD (OECD, 2022). The pandemic decreased available domestic revenue for the SDGs as spending related to the pandemic, e.g., to cover vaccine roll outs, was more urgent. The pandemic put large pressure on government budgets and increased short-term borrowing. Further, it decreased growth prospects which are decisive for further progress. Among other, economic growth is the key driver of domestic revenue. For instance, Gaspar et al. (2019) estimate additional spending to finance the SDG agenda in LIDC at 15 percentage points of their GDP. They argue that doubling projected GDP per capita in 2030 would reduce the additional spending necessary to finance the SDG agenda by 4.5 percentage points. Additional spending necessary to finance the SDGs would amount to 10.5 percentage points of LIDC' GDP. The financing gap in LIDC thus reduces by approximately 30 percent. For our scenario analysis in Table 10, a reduction of additional spending would leave a financing gap of USD 2,800 billion in developing countries, corresponding to 2.8 percent of World GDP.

Governments are now faced with high debt service repayments which is further exacerbating due to tightening of global conditions. UNCTAD estimates that during 2020 and 2050 low-income countries will spend 18.6 percent, lower-middle income countries will spend 39.8 percent and upper-middle income countries will spend 66.3 percent of tax revenue on external debt. The calculations were made even before developed countries started to hike interest rates. The OECD expects the financing gap in developing countries to widen by 10 percent given tight global conditions (OECD, 2022).

Above we have highlighted the role of public and private domestic revenue in closing the financing gap. We further argued that global conditions are very important to consider as recent crises have shown that the financing gap has widened significantly. The remaining gap will have to be financed by the international community. Benedek et al. (2021) argues that increasing official aid to the UN target of 0.7 percent of GNI would largely cover the gap. Recent crises have shown that increases in ODA are possible: As response to the war of Russia against Ukraine, aid increased by 17 percent in 2022 relative to 2021. We estimate that if high income countries were to increase ODA to the UN target of 0.7 percent of GNI, ODA would sum up to USD 431 billion which is an increase of USD 227 billion relative to 2022. As GNI will increase over time, ODA could contribute even more in the following years. With the additional financing, it would be possible to close the financing gap in LIC in our scenario analysis in Table 10. The remaining financing can be used to further help LMIC in financing the SDG agenda.

Scenario	Contribution	Financing Gap ^a					
		Developing countries		LIC		LMIC	
		<i>in billion USD</i>	<i>in % of World GDP</i>	<i>in billion USD</i>	<i>in % of World GDP</i>	<i>in billion USD</i>	<i>in % of World GDP</i>
Business as usual		4,000	3.95%	138-150	0.14-0.15%	549-1238	0.54-1.22%
Increase the tax-to-GDP ratio to close the financing gap in emerging economies	USD 3,240-3,600 billion	400 ^b -760 ^c	0.4-0.8%	138-150	0.14-0.15%	549-1238	0.54-1.22%
Increase the tax-to-GDP ratio by 3-7 percentage points	According to Table 9, this contributes between USD 1,110 billion (+3pp) and USD 2,590 billion(+7pp)	1,410-2,890	1.4-2.8%	74-80 ^d	0.73-0.78%	295-665	0.29-0.66%
Increase private sector participation to levels of developed economies	Reduces the gap by 70% (USD 2,800 billion)	1,200	1.2%	41-45 ^e	0.04%	164-371	0.16-0.37%
Double projected GDP per capita	Gaspar et al. (2019) assume that this would reduce additional spending in LIDC by 30%. We take over this number for all countries in our scenario.	2,800	2.8%	96-105	0.09-0.10%	384-866	0.37-0.85%
High income countries increase ODA to the UN target of 0.7% of GNI	ODA would increase to USD 431 billion ^f (an increase of 110% relative to record high of USD 204 billion in 2022 ^g) and thus contribute an additional USD 227 billion in 2022	3,773	3.7%	0 ^h	0	472-1161	0.46-1.15%

Table 10: Approaches to close the SDG Financing Gap

^aOwn estimates.^bSachs et al. (2019)^cGaspar et al. (2019)^dWe assume an average reduction of the financing gap to 53.75% in LIC and LMIC.^eWe assume that LIC and LMIC increase private sector participation to 70%.^fWe calculate ODA by taking 0.7% of high-income countries' GNI in 2022 as classified by the World Bank. If GNI in 2022 is not available, we take the GNI in 2021.^gSummers et al. (2023)^hWe assume that the majority of the increase in ODA flows to LIC. The remaining financing flows to LMIC.

5 Conclusion

Achieving the SDG agenda requires large investment which is especially challenging for developing countries. We identify an annual financing gap of USD 4,000 billion. This equals 10.2 percent of developing countries' GDP, 3.95 percent of the World's GDP and 7.1 percent of advanced economies' GDP in 2022. A substantial share of the financing gap can be contributed to financing affordable and clean energy (SDG 7) as well as climate action (SDG 13). The gap has widened in recent years due to underinvestment and additional financing needs. While progress in achieving the SDG agenda has been below expectations since its announcement, the pandemic and the recent worsening of global conditions that started with the war in Ukraine led to further underinvestment. Also, needs in financing energy and climate action have broadened over time and will continue to do so if action is delayed further. We explore approaches to finance the gap of USD 4,000 billion and find that increasing domestic revenue is pivotal for progressing towards the Goals. Increasing tax-to-GDP ratios will close the gap in emerging economies, leaving a gap of between USD 400 billion and USD 760 billion in low-income developing countries. Focusing on domestic capacities, countries can further increase private sector participation. Private sector participation in developing countries is low in comparison to developed countries and there is substantial scope for increasing participation, especially in infrastructure. Responsibility lies also with the international community. Global conditions are a strong influence for the financing gap as is evident given that the gap has widened considerably due to recent multiple crises. GDP growth which is dependent on global conditions is crucial for stabilizing or even increasing revenues in developing countries. High interest rate payments put additional pressure on developing countries' budgets. There is also an important role for ODA. Increasing ODA to the UN target of 0.7 percent of GNI in high-income countries would help close the remaining gap. Additional financing by the international community is crucial for low-income countries as they face difficulties in increasing tax-to-GDP ratios. Importantly, increasing ODA to the UN target would close the financing gap in low-income countries.

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Appendix A Abbreviations and acronyms

DFI	Development finance institution
EMDE	Emerging markets developing economies
GDP	Gross domestic product
GNI	Gross national income
LDC	Least developed countries
LIC	Low-income countries as classified by the World Bank
LIDC	Low-income developing countries as classified by Gaspar et al. (2019)
LMIC	Low-middle-income countries as classified by the World Bank
MDB	Multilateral development banks
MDG	Millennium Development Goals
ODA	Official Development Assistance
PPP	Purchasing Power Parity
SDG	Sustainable Development Goal
UMIC	Upper-middle-income countries as classified by the World Bank
USD	United States dollar

Appendix B Additional plots

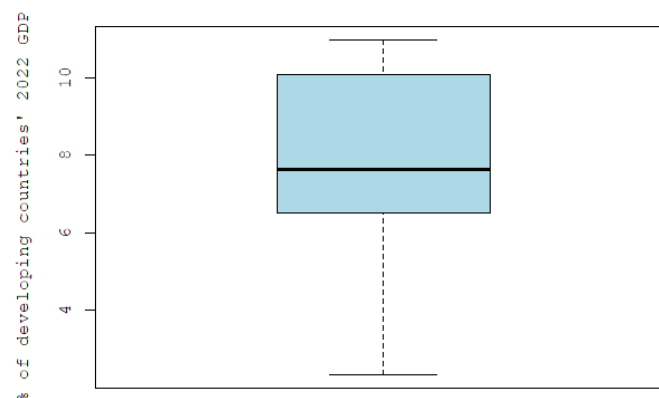


Figure 7: Annual financing gap as % of developing countries' GDP, 2015-2030

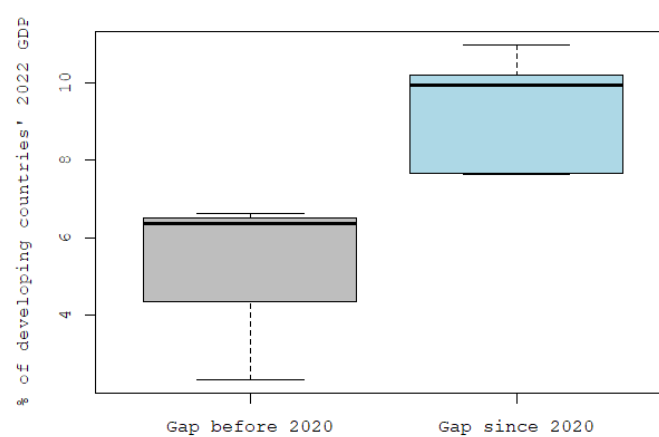


Figure 8: Annual financing gap as % of developing countries' GDP over time