Supplementary technical annex

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Annex I. Methodological overview

Country scope

We define a set of 139 emerging markets and developing economies (EMDEs) as follows:

- IDA or IBRD eligible countries (excl. China)
- Small Island Developing States (excl. Singapore)
- Vulnerable 20 (V20) members

Throughout this report, EMDE refers to this set, unless otherwise specified.

It is standard practice to include China in the EMDE country grouping. We have, however, excluded China from this group in this paper because China has the resources and capacity to develop sustainably without financial support from other countries and is better treated as a provider of development support to others than as a potential aid recipient. Singapore is also excluded despite its status as a Small-Island Developing State, as it is an advanced economy. Several countries were also removed due to insufficient GDP and/or population data: the Cook Islands, Cuba, Eritrea, Niue, Palau, Syria, Tuvalu, and the West Bank and Gaza.

Note that the definition of EMDEs excl. China does not exactly correspond to the non-Annex I parties to the UNFCCC.

Building a country dataset

For our aggregate analysis, we compiled a country-level dataset across the eight sectors described in Annex II, using estimates from a variety of reports and academic publications. While some of these sources had comprehensive country-level data, others were limited to income or regional data (see Table 1). When country-level data was lacking or incomplete, we used averages, in per-capita or percent of GDP terms, to achieve country-level coverage. Countries would be assigned an average based on their income-region (i.e., Lower-middle income, Africa), income group, or region. This allowed us to ensure a standardized scope of countries, since sources varied in their country coverage. For example, estimates from the International Energy Agency included several Middle Eastern countries, which we exclude, and excluded several European countries, which we include. Additionally, we took measures to harmonize the units across all the different sources. As needed, we used the IMF World Economic Outlook GDP deflator—or, in the case of health and education, the ratio of GDP per capita for the two different base years—to convert to 2022 $US. All dollar values in this report are expressed in terms of 2022 $US.

Forecast modeling

For baseline spending, we use 2022 data for each sector (or the latest data in percent of GDP terms, if missing). To assess the scale-up of spending on investment priorities, we compile 2030 and 2035 data. Several of our sectors have 2030 and 2035 estimates provided directly from their respective sources. Others have a decadal average for the additional costs required, which we project out to 2030. In the event 2035 data is unavailable, we hold the costs constant out to 2035, in percent of GDP terms.

Table 1: Summary of data sources and coverage

	Source	Indicator Name	Units	Coverage	Time
Health					
Baseline	World Health Organization (2025)	Domestic general government health expenditures	% of GDP	142 countries	2022
Targets	Stenberg et al. (2019)	Additional primary health care per capita cost, Recurrent and capital	2014 $US	3 income groups	Average 2020-2030
		Country shares of additional cost for primary health care	% of total	67 countries	
	Stenberg et al. (2017)	Additional resource needs for First-level clinical services	% of total	Average across 67 countries	
Education					
Baseline	UNESCO (2025)	Government expenditure on: Education, total	% of GDP	130 countries	2022
Targets	UNESCO (2023)	Education cost	2019 $US	79 countries (LICs and LMICs)	2030
Energy					
Baseline	International Energy Association (2024)	Clean energy investments in EMDEs to align with sustainable development and climate goals	2023 $US	7 regions and India	2023
Targets			2023 $US		2030, 2035
Other sustainable infrastructure					
Baseline	Author's estimates	Spending on other sustainable infrastructure	% of GDP	5 regions	2022
Targets		Estimated costs for sustainable infrastructure	% of GDP	5 regions	2030, 2035

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	Source	Indicator Name	Units	Coverage	Time
Adaptation					
Baseline	IHLEG (2024)	Spending on adaptation (See Figure 1.1)	2022 $US	EMDE excl. China total	2022
Baseline	UNEP (2023)	Adaptation-specific finance received	2022 $US	17 EMDEs	Total 2017-2021
Targets	UNEP (2024)	Modelled adaptation costs	2022 $US	7 regions, 3 income groups (21 region-income groups)	Average 2020-2030
Loss and damage					
Baseline	IHLEG (2024)	Spending on loss and damage	2023 $US	EMDE excl. China total	2022
Baseline	Our World in Data (2025)	Annual economic damages from disasters	% of GDP	140 countries	Average 2013-2022
Targets	IHLEG (2024)	Investment needs for loss and damage	2023 $US	EMDE excl. China total	2030, 2035
Just transition					
Baseline	IHLEG (2024)	Spending on just transition	2023 $US	EMDE excl. China total	2022
Baseline	Global Energy Monitor (2025)	Coal Workforce Size by Country/Area	Number of employees	70 EMDEs	2025
Targets	IHLEG (2024)	Investment needs for a just transition	2023 $US	EMDE excl. China total	2030, 2035
Natural capital and sustainable agriculture					
Baseline	UNEP (2023)	Finance for protection of biodiversity	% of national budget	7 regions	2022
			2023 $US	Global total	2022
Targets		Additional NbS investment needs, Rio-aligned	2023 $US	10 regions and Brazil, India, Russia	2030, 2035

Annex II. Sectoral investment priorities

This analysis compiles investment priorities for emerging markets and developing economies across eight sectors: health, education, the energy transition, other sustainable infrastructure, adaptation and resilience, loss and damage, the just transition, and nature & sustainable agriculture. In the following sections, we explain how priority investments have been identified and costed for each sector. We also provide estimates of current spending, compared to the spending necessary in 2030 and 2035 to implement these priority investments, across our defined scope of countries (see Annex I). **Table 2** below shows these results totaled across all eight sectors.

Overall, we see an increase in priority spending from $2.4 trillion in 2022 to $8.3 trillion by 2035 (an increment of about $6 trillion). Nearly all of this spending is in middle-income countries, with only 4% of 2035 spending in low-income countries. For most regions, the increase in 2035 over 2022 levels is around 3x; for Africa and the Middle East, it is over 4x because of their low initial spending levels. The largest absolute level of regional spending increase is in Asia ($2.2 trillion), but as a percent of GDP, the increase in Asia is the lowest among all regions (8 percentage points of GDP). Africa should see the largest increase in terms of GDP (22.4 percentage points of GDP), followed by the Middle East (15.6 percentage points). Just over a third of the 2035 spending is in Asia, and about a fourth is in Latin America.

Table 2: Total baseline spending and targets

Total annual spending	Percent of GDP			2022 USD per capita			8688.USD?billions		
	2022	2030	2035	2022	2030	2035	2022	2030	2035
All EMDEs	**10.6%**	**21.5%**	**22.0%**	**444**	**1099**	**1338**	**2380**	**6489**	**8340**
Low income	9.3%	33.2%	33.7%	70	299	362	49	258	352
Lower middle income	9.7%	20.5%	20.0%	266	744	947	927	2837	3800
UMC + other EMDEs	11.3%	21.9%	23.5%	1189	2766	3350	1404	3393	4188
Africa	10.1%	31.5%	32.5%	211	608	702	304	1047	1335
Asia	10.0%	18.9%	18.1%	288	778	998	757	2201	2936
Europe & Central Asia	9.8%	20.2%	22.9%	1104	2885	3768	516	1356	1774
Latin America	12.5%	22.3%	23.3%	1144	2475	2896	730	1663	1995
Middle East	9.6%	23.0%	25.2%	386	1035	1312	73	221	299

Health

EMDEs spent an average of 2.5% of GDP on general government health expenditure in 2022 according to the World Health Organization. To expand access to healthcare and improve the quality of services in EMDEs, this spending should be increased to an average of 4.5% of GDP per year by 2035 (+2 percentage points of GDP). This objective is in line with the most conservative estimates for primary healthcare targets in the Declaration of Astana— an agreement by World Health Organization member states at the Global Conference on Primary Health Care in 2018.[1]

Identifying priorities: In 2018, World Health Organization member states met at the Global Conference on Primary Health Care in Astana, Kazakhstan. They signed the Declaration of Astana, affirming their commitment to strengthening primary health care, which they deemed the "most inclusive, effective and efficient approach to enhance people's physical and mental health".[2] Building on this, a multi-stakeholder initiative co-chaired by representatives from Kenya and Norway developed a Lusaka Agenda to evolve the current Global Health Initiative ecosystem so as to meet the challenges of the future and deliver universal health care. [3] The first key shift in the Lusaka Agenda is to "make a stronger contribution to primary health care (PHC) by effectively strengthening systems for health." Stenberg et al. 2019 provides estimates of the scale of investments required to realize priority improvements in primary healthcare. In prior work (Stenberg et al., 2017), they also include expenditures for complementary non-primary healthcare.[4] We add the estimates provided by Stenberg et al. to a 2022 baseline level of general government health expenditure taken from the World Health Organization.

Costing investments: Stenberg et al. break out three types of priority expenditures: (i) increases in the quantity and quality of the health workforce; (ii) increases in the infrastructure of health clinics; and (iii) medical commodities such as equipment, pharmaceuticals, and diagnostic tools. The minimum set of measures they recommend would result in the number of healthcare workers (doctors, nurses, and other health professionals) rising from 5.6 per 1000 population in 2016 to 6.7 per 1000 by 2030.[5] It would provide an average of 3 additional outpatient visits per person per year. Through preventative treatment and care, it could avert an estimated 60.1 million deaths, including infant and child mortality, maternal deaths, deaths from cancer, non-communicable diseases, tuberculosis, and HIV.[6]

Roughly a third of the investment is for the health workforce, a fourth for infrastructure, and a fifth for medical commodities, with the remainder covering logistics, program management, and supply chains. These investments include both recurrent expenses, such as health workers' salaries, as well as capital expenses, such as infrastructure.

In addition to the primary healthcare data, we incorporate other healthcare expenses as in Stenberg et al. 2017 for upper-middle income countries, half of that increment for lower-middle income countries, but no increment for low-income countries.

We estimate that across our defined EMDEs, an additional 2 percentage points of GDP should be spent on health by 2035 to improve primary healthcare— an increase from around 2.5% of GDP in 2022. In per capita terms, this equates to an increase of $165 per person per year, reaching a cost of $270 per person by 2035. This varies greatly by country, and we observe different trends by income groups and regions (**Table 3**). Upper middle-income countries require the largest incremental health financing— about 53% of incremental investment priorities in 2035. However, this only amounts to an additional 1.6% of their GDP. Meanwhile, low-income countries should make the biggest accelerations to reach spending levels that are 9x the current levels by 2035 or an additional 8.8% of GDP.

Table 3: Health baseline spending and targets

Health annual spending	Percent of GDP			2022 USD per capita			8688.USD?billions		
	2022	2030	2035	2022	2030	2035	2022	2030	2035
All EMDEs	**2.5%**	**4.6%**	**4.5%**	**105**	**233**	**270**	**565**	**1377**	**1686**
Low income	1.1%	10.0%	9.9%	8	90	106	6	78	103
Lower middle income	1.5%	3.7%	3.6%	41	135	171	143	515	684
UMC + other EMDEs	3.4%	5.1%	5.0%	353	640	719	416	785	898
Africa	2.1%	8.7%	8.7%	44	168	188	63	290	357
Asia	1.5%	3.1%	3.0%	44	129	168	117	366	495
Europe & Central Asia	2.6%	3.9%	3.9%	288	553	635	134	260	299
Latin America	4.1%	5.5%	5.5%	374	609	683	239	409	471
Middle East	1.5%	5.4%	5.4%	62	245	282	12	52	64

Education

EMDEs spent an average of 4% of GDP on government expenditure on education in 2022 according to UNESCO. To work towards quality education for all and achieve their national benchmarks, this spending should be increased to an average of 5.9% of GDP per year by 2035 (+1.9 percentage points of GDP).

Identifying priorities: A ministerial global education meeting on education was held in Fortaleza, Brazil from 31 October to 1 November 2024, organized by UNESCO. Ministers reaffirmed "that education is a fundamental human right and a public good," but they also concluded that achieving the SDG 4 targets was no longer feasible. They committed to lower targets that they themselves have set for 2030. If the targets are met across 79 low- and middle-income countries, the early childhood education participation rate would rise to 85% and the out-of-school rate for primary, lower secondary, and upper secondary school would be lowered to 5%, 11%, and 26% respectively.[7] Ministers committed to allocate at least 4-6% of GDP to education, conforming to assessments provided in a background paper prepared by UNESCO that provided country-by-country estimates for 79 countries.[8] We add these estimates to a 2022 baseline level of government expenditure on education, provided by UNESCO via the World Development Indicators.[9]

Costing investments: The costing model focused on SDG indicator 4.2.2 (early childhood) and the out-of-school rate thematic indicators in SDG 4.1.4. It does not include additional expenses that may be required to train teachers, to ensure minimum learning proficiency, and to eliminate gender gaps. The costing model includes reaching the following target pupil-teacher ratios: pre-primary 20:1, primary 40:1, and secondary 30:1. The educational investments needed to reach these goals include teacher salaries, per-pupil costs, and construction of classrooms to ensure at least one classroom per teacher. Some 5 million more teachers will be needed by 2030 for LICs and LMICs, which would help educational access and quality through a decline in teacher-pupil ratios. This is necessary, especially for pre-primary educators, who will need to triple in LICs and double in LMICs by 2030. Salary increases are also included for special cases, such as for those teaching disadvantaged students. Similarly, per-pupil expenses should be increased and a special mark-up is included based on the share of students below the poverty line.

Education spending and targets vary across different income groups and regions (**Table 4**). Low-income countries could scale up from spending around 3.6% of GDP on education to nearly 9% and African countries from 3.9% to nearly 10% of GDP. However, upper middle income countries and other EMDEs have the greatest overall costs, making up about half of the total costs we estimate for education investment priorities in 2035.

Table 4: Education baseline spending and targets

Education annual spending	Percent of GDP			2022 USD per capita			8688.USD?billions		
	2022	2030	2035	2022	2030	2035	2022	2030	2035
All EMDEs	**4.0%**	**6.0%**	**5.9%**	**166**	**305**	**356**	**888**	**1803**	**2222**
Low income	3.6%	9.0%	8.9%	28	81	96	19	70	93
Lower middle income	3.3%	5.2%	5.1%	90	188	240	312	718	964
UMC + other EMDEs	4.5%	6.5%	6.5%	471	827	932	556	1015	1165
Africa	3.9%	9.8%	9.8%	82	189	212	118	325	403
Asia	3.2%	4.3%	4.2%	91	177	234	238	500	688
Europe & Central Asia	4.1%	6.5%	6.5%	457	933	1073	214	438	505
Latin America	5.0%	6.5%	6.5%	455	718	804	290	483	554
Middle East	3.6%	5.9%	5.9%	147	266	309	28	57	70

Energy transition

EMDEs allocated approximately 1.2% of their GDP to clean energy transition efforts in 2022. To align with a global pathway to net-zero emissions by 2050, their investment must increase to about 5.7% of GDP per year by 2035. This scale-up will close existing funding gaps, accelerate reductions in greenhouse gas emissions, expand access to affordable clean energy (SDG 7), and improve air quality (SDGs 3 and 11).

Identifying priorities: In December 2023, COP28 was held in Dubai, United Arab Emirates—bringing together nearly 200 countries to reaffirm their commitment to limiting global warming to 1.5 degrees Celsius under the Paris Agreement. They made several pledges, including a commitment to triple the world's installed renewable energy capacity by 2030.[10] The International Energy Agency (IEA) World Energy Outlook 2024 provides investment estimates for a Net Zero Pathway in emerging and developing economies ex-China, which aligns with this pledge. The IEA further developed a Clean Energy Investment Roadmap in Developing Economies, to support Brazil's G20 Presidency. We chose these sources for their comprehensive scope, rigorous methodology, and detailed, context-specific breakdowns of investment priorities for EMDEs excluding China. While several other respected sources were reviewed (e.g., G7 Independent Report, Vivid Economics, ETC, IPCC, McKinsey, IRENA), the IEA provides uniquely granular insights into sectoral and regional investment requirements, including a modelled partitioning of priority spending between public and private sectors.

Costing investments: The IEA highlights two interconnected priorities for EMDEs other than China: meeting rapidly growing energy demand and achieving low-emission development. Currently, around 80% of clean energy investments focus on renewable generation technologies—primarily solar and wind—driven by significant cost reductions and favorable policy frameworks. However, critical areas such as energy efficiency, end-use electrification, low-emission fuels, and carbon capture, utilization, and storage (CCUS) remain underfunded.

Clean energy investments fall broadly into two categories: supply-side and demand-side infrastructure. On the supply side, renewable energy generation is expected to represent roughly 40% of all clean energy investments by 2030 and 2035. Scaling solar PV, wind (onshore and offshore), hydropower, and geothermal projects is particularly crucial, given that EMDEs hold about 70% of the world's solar and wind potential (RMI, 2024). Additionally, around 15–20% of total spending must be directed toward grid modernization, including expanding transmission and distribution networks, establishing interconnections, developing smart-grid technologies, and integrating grid-level battery storage. These infrastructure investments are essential for reliably incorporating higher shares of variable renewable energy into power systems.

On the demand side, approximately 30–35% of future spending should target energy efficiency improvements and electrification initiatives. Efficiency measures in residential and commercial buildings—such as better insulation, efficient heating and cooling systems—and industrial processes and appliances are essential for significantly lowering energy consumption and emissions. Simultaneously, electrifying end-use sectors, particularly transportation (electric vehicles and charging infrastructure), industries, and residential/commercial heating, will further reduce fossil fuel dependence. Finally, investments in low-emission fuels and CCUS—accounting for about 7–10% of total future spending—will be essential for decarbonizing sectors that are challenging to electrify, notably cement, steel, and heavy transportation.

Investment priorities vary significantly by income level and region (Table 5). Overall, EMDEs other than China must increase clean energy investments from 1.2% of GDP ($260 billion in 2022) to 5.7% of GDP ($2,160 billion by 2035), a more than eight-fold rise. Low-income countries and regions like Africa face the steepest relative increases, from around 1.1% of GDP in 2022 to approximately 8.1% of GDP by 2035, highlighting their critical need for sustainable energy access and economic resilience. In absolute terms, Asia requires the largest increase and should spend $746 billion annually by 2035 due to substantial population and economic growth.

Table 5: Energy transition spending and targets

Energy annual spending	Percent of GDP			2022 USD per capita			8688.USD?billions		
	2022	2030	2035	2022	2030	2035	2022	2030	2035
All EMDEs	**1.2%**	**5.7%**	**5.7%**	**48**	**289**	**347**	**260**	**1706**	**2160**
Low income	1.1%	7.5%	8.1%	8	68	87	6	58	84
Lower middle income	1.3%	5.6%	5.3%	35	203	249	123	776	1000
UMC + other EMDEs	1.1%	5.6%	6.0%	111	711	861	131	872	1076
Africa	1.1%	7.6%	8.1%	23	148	175	34	254	334
Asia	1.3%	5.2%	4.6%	38	213	254	100	601	746
Europe & Central Asia	1.0%	5.8%	6.6%	113	824	1083	53	387	510
Latin America	1.1%	5.4%	5.5%	105	597	681	67	401	469
Middle East	0.7%	6.5%	8.4%	30	292	440	6	62	100

Adaptation and resilience

EMDEs currently allocate approximately $80 billion (0.4% of their GDP) to climate adaptation and resilience efforts, which should be raised to approximately $332 by 2035 (0.9% of GDP) annually by 2035—over four times the current level. This increase is critical to protect vulnerable populations and infrastructure from escalating climate risks, reduce economic losses from extreme weather, and strengthen overall economic stability and sustainable development outcomes. The modeled costs of adaptation incorporate the priorities for adaptation in the following sectors: coastal zones, river floods, infrastructure, agriculture, fisheries, disease control, and early warning systems.

Identifying priorities: Data for adaptation and resilience investment priorities for 2030 and 2035 are provided by UNEP (2024).[11] UNEP's Adaptation Gap report provides a set of modelled adaptation priorities that are substantially lower than the adaptation estimates set out in country Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs).[a] UNEP's methodology incorporates four types of investments: (i) no and low-regret ex.post.responses to climate shocks; (ii) climate proofing; (iii) adaptive management of systems; and (iv) transformative system change. It models the cost of reaching several of the targets laid out in the United Arab Emirates Framework for Global Climate Resilience, agreed at COP28 in Dubai. We select the modelled estimates as they provide consistency across countries for adaptation costs, which are otherwise inherently challenging to quantify and compare across countries due to unclear definitions and baselines, varied local climate impacts, and differences in existing infrastructure levels. Modelled adaptation costs depend on assumptions about global mitigation efforts, the consequent impact on temperatures and climate change, and the economic damage that results. The most recent studies suggest larger climate effects, larger economic damages, and hence the likely need for even higher adaptation spending. UNEP's modelled costs do not include costs of adapting most private sector infrastructure and assets, nor the costs of heat-related impacts on labor productivity.

Baseline estimates for adaptation are not readily available, and different sources provide a wide range of values and coverage. We use a 2022 baseline expenditure figure of $80 billion sourced from Figure 1.1 of the 2024 IHLEG report.[12] The country composition is based on income averages calculated from a sampling of countries analysed in the UNEP 2023 Adaptation Finance Gap

[a] These estimates were provided by the Finance chapter team of the Adaptation Gap Report (Nella Canales, Dipesh Chapagain, Paul Watkiss). The data is based on the updated 2022 analysis of modelled costs, finance needs and international public adaptation finance flows. The data was produced with cofinancing from i) the ECONOGENESIS project funded by UK aid from the UK government and by the International Development Research Centre, Ottawa, Canada as part of the Climate Adaptation and Resilience (CLARE) research programme, ii) the Assessing Climate Change Risk in Europe project (ACCREU), funded by the European Union through the Horizon Europe Research and Innovation Action (RIA) and UK Research and Innovation (UKRI) under the UK Government's Horizon Europe guarantee and iii) The core funding to the Stockholm Environment Institute (SEI) by the Swedish International Development Cooperation Agency (Sida). Note that the views and opinions expressed are those of the author(s) only.

Update report.[13]

Costing investments: UNEP emphasizes the importance of shifting adaptation finance from reactive, incremental interventions toward proactive, transformative strategies—particularly in areas that require strong public sector leadership and that are more difficult to finance through private channels. The analysis highlights key priority sectors: agriculture, water, and infrastructure currently dominate adaptation finance needs and existing flows, although current investments still fall significantly short of what is required. A notable gap exists regarding private-sector adaptation needs, including costs related to private infrastructure, industrial cooling, and productivity losses due to heat stress. These elements remain inadequately tracked, and thus current estimates may significantly underestimate the true magnitude of adaptation financing required.

Adaptation and resilience investments in EMDEs ex China should focus on six interrelated sectors. First, investments in agriculture, water, and infrastructure—representing approximately half of modelled adaptation costs—are vital for safeguarding food security, enhancing water management systems (reservoirs, irrigation infrastructure), and climate-proofing essential buildings and transportation networks. Second, coastal protection, accounting for around 5-10% of costs, involves investments such as mangrove restoration, seawalls, and coral reef conservation to protect vulnerable communities from rising seas and storm impacts.

Third, forests and ecosystems require investment in nature-based adaptation measures, including wetland restoration and grassland conservation, to maintain biodiversity, regulate water cycles, and enhance soil health. Fourth, roughly 10% of modelled costs are oriented towards addressing increases in malaria, dengue, and diarrheal diseases, heat-related mortality, plus disease surveillance and resilience for water, sanitation, and hygiene. Fifth, extreme weather and disaster risk management necessitates investments in early warning systems, risk financing mechanisms (e.g., catastrophe bonds), and community-driven contingency planning to mitigate disaster impacts and recovery costs.

Sixth and last, significant investments—approximately 25% of modelled adaptation costs—must be directed toward strengthening institutional capabilities, integrating adaptation strategies into policy frameworks, and fostering inclusive participation of marginalized groups. Gender considerations are crucial since women often face higher barriers to accessing financial resources, technical training, and decision-making roles in adaptation contexts (Gannon et al., 2022).

Investment priorities differ significantly by region and income level (Table 6). Upper middle-income countries and other EMDEs experience the most substantial proportional increase—from 0.4% to 1.3% of GDP. Africa, highly susceptible to droughts, floods, and heat stress, should increase investments from 0.4% to 0.9% of GDP. Latin America also faces substantial increases

due to significant exposure to coastal storms, agricultural disruptions, and water scarcity. This investment scaling is critical to effectively manage climate risks and secure sustainable, resilient development across developing regions.

Table 6: Adaptation spending and targets

Adaptation annual spending	Percent of GDP			2022 USD per capita			8688.USD?billions		
	2022	2030	2035	2022	2030	2035	2022	2030	2035
All EMDEs	**0.4%**	**0.6%**	**0.9%**	**15**	**31**	**53**	**80**	**183**	**332**
Low income	0.6%	2.1%	1.6%	5	19	17	3	16	17
Lower middle income	0.3%	0.5%	0.4%	9	17	19	32	66	77
UMC + other EMDEs	0.4%	0.6%	1.3%	38	82	190	44	100	238
Africa	0.4%	1.1%	0.9%	8	21	20	12	36	38
Asia	0.3%	0.4%	0.4%	10	18	19	26	51	57
Europe & Central Asia	0.4%	0.3%	2.0%	40	38	323	19	18	152
Latin America	0.4%	1.0%	0.9%	33	107	111	21	72	77
Middle East	0.4%	0.6%	0.6%	14	27	32	3	6	7

Loss and damage

EMDEs currently allocate approximately 0.4% of their GDP to cover loss and damage from climate impacts. To cope with escalating climate-related disasters—such as floods, storms, and slow-onset events – this should be increased to 1.1% of GDP per year by 2035. This increase would enable countries to manage and recover from climate shocks more effectively, protect vulnerable communities, and reduce long-term economic disruptions.

Identifying priorities: The Warsaw International Mechanism for loss and damage associated with climate change impacts provided an early (2013) framework for economic losses of property, infrastructure, agricultural production, and other quantifiable economic losses as well as non-economic losses such as health, cultural, and ecosystem changes. Here we focus on economic losses.

We draw on Markandya and González-Eguino (2019) for loss and damage (L&D) estimates due to their granular coverage of timeframes and regions.[14] While several other studies (e.g., Baarsch et al. (2015)[15], Richards et al. (2023)[16], Newman and Noy (2023)[17]) also analyze the economic impacts of climate change, Markandya and González-Eguino provide particularly detailed modeling results specific to developing countries, making them a useful reference point. However, as with any Integrated Assessment Model (IAM), their estimates may still understate non-economic losses (e.g., impacts on cultural heritage, health, and biodiversity).

Markandya and González-Eguino (2019) do not prescribe a universal priority framework for managing loss and damage—reflecting the reality that L&D needs vary significantly by country and local context. No widely agreed definition of "loss and damage" exists, making it difficult to quantify existing losses and future financing needs. Rising climate-related disasters and economic losses (exceeding $109 billion in EMDEs in 2022 alone (Richards et al., 2023)) highlight the urgent need for more robust data, improved tracking of non-economic losses, and context-specific strategies that can accurately capture the full scale of harm. Ultimately, fragmented definitions and uncertain climate projections remain key barriers to determining clear, universal priorities for L&D investments.

Markandya and González-Eguino (2019) provide a range for the economic damage from climate change of 650 billion to 1.2 trillion in 2035. Governments cannot compensate for all such damage. Richards et al. accordingly conclude that discussion of loss and damage finance should use $400 billion per year as a floor, while acknowledging that uncertainties imply that this amount may need to be revised over time, likely in an upward direction. We use this floor level in this paper.

The global number for loss and damage follows IHLEG 2024 and is then allocated across countries based on historical decadal shares (2013-2022) of loss and damage taken from Our World in Data.[18,19]

Costing spending: Direct compensation—through financial relief and post-disaster reconstruction—ensures that climate shocks do not trap vulnerable populations in cycles of poverty, while also preventing cascading economic disruptions. At the same time, institutional strengthening in disaster preparedness, emergency response, and workforce development is critical for long-term resilience; building such capacity helps governments and local actors respond more effectively to increasingly severe and unpredictable climate events.

Table 7 illustrates the scale of required annual loss and damage spending across regions and income categories. All EMDEs should raise their estimates for loss and damage spending from current levels of 0.4 percent of GDP to 1.1 percent of GDP by 2035, an increase from $80 billion to $400 billion. Asia faces the largest absolute rise, reflective of its exposure to extreme weather and high population density, jumping from $43 billion in 2022 to $217 billion by 2035. Low-income countries, although responsible for a smaller share of the total, may suffer from nearly a tripling of loss and damage as a percent of GDP by 2035, underscoring how limited fiscal space can magnify climate vulnerability. Integrating loss and damage investments—which focus on addressing unavoidable climate impacts—with adaptation investments—such as flood defences and resilient infrastructure—can help reduce future losses and secure more sustainable recovery in a rapidly changing climate.

Table 7: Loss and damage spending and targets

Loss and damage annual spending	Percent of GDP			2022 USD per capita			8688.USD?billions		
	2022	2030	2035	2022	2030	2035	2022	2030	2035
All EMDEs	**0.4%**	**0.8%**	**1.1%**	**15**	**42**	**64**	**80**	**250**	**400**
Low income	0.3%	0.7%	0.8%	2	6	9	2	5	9
Lower middle income	0.5%	1.0%	1.2%	13	38	57	46	143	230
UMC + other EMDEs	0.3%	0.7%	0.9%	27	82	130	32	101	162
Africa	0.2%	0.5%	0.6%	4	9	14	5	16	26
Asia	0.6%	1.1%	1.3%	16	47	72	42	132	211
Europe & Central Asia	0.1%	0.4%	0.5%	16	51	82	8	24	38
Latin America	0.4%	1.0%	1.4%	36	107	168	23	72	116
Middle East	0.3%	0.6%	0.8%	10	28	42	2	6	10

The just transition

EMDEs currently allocate approximately 0.04% of their GDP on the just transition. This should be increased to 0.13% GDP per year by 2035 to support workers and communities through the shift to a low-carbon economy. This funding can safeguard against job dislocation, support retraining for new green industries, and strengthen social safety nets, to ensure that vulnerable populations are not left behind, reduce inequalities and foster sustainable, resilient, and inclusive growth.

Identifying priorities: Most estimates for just transition costs in developing countries come from country-level analyses, particularly the World Bank's Country Climate and Development Reports (CCDRs).[20] These studies focus heavily on regions where coal dominates local economies—such as South Africa, Indonesia, and Vietnam—illustrating the economic, social, and environmental challenges that arise when phasing out fossil fuels. We used country-level analyses as a key reference because just transition costs are highly context-specific, varying based on each country's industrial structure, labor market composition (especially the size of the informal sector), and the degree of dependency on fossil fuels. Notably, existing studies often concentrate on coal-related transitions, leaving gaps in our understanding of the broader spectrum of fossil fuel phaseouts and the needs of affected workers and communities. This underscores the demand for more data and analysis across a wider range of industries and socioeconomic contexts.

Costing investments: A successful just transition demands targeted investments in workers, communities, and economic resilience. In many developing countries, large numbers of informal workers lack essential benefits—such as unemployment insurance, pensions, or severance pay—rendering traditional labor policies insufficient. Consequently, social safety nets must expand to offer wage subsidies, cash transfers, and community-based support to help displaced workers in both formal and informal sectors transition into the green economy. Reskilling programs, delivered through mobile training centers and local education initiatives, must be broadly accessible so that women and other marginalized groups can secure stable employment in new green industries.

Beyond employment, regional economic diversification is critical to averting potential collapse in areas formerly reliant on fossil fuels. Public and private investments in emerging industries, small businesses, and supportive infrastructure can sustain economic vitality, while upgrades in education, healthcare, and housing help communities remain livable and prosperous. Where coal phaseouts are central (e.g., South Africa, Indonesia, Vietnam), a comprehensive package of early retirement schemes, community transition funds, and infrastructure repurposing can stabilize local economies. Land reallocation and cooperative-led resettlement can further safeguard livelihoods in regions undergoing deep structural change.

Just energy transitions are highly context-specific and initially focused on those countries that are using domestically produced coal to generate electricity. There, the transition to low-carbon systems could have serious implications for local communities. One example of a detailed estimate is from the case of South Africa, where the Blended Finance Taskforce and Centre for Sustainability Transitions (2022) identified a need for up to $10 billion for climate justice outcomes within part of a larger $250 billion costing of the green transition.[21] Note that this does not include financing for the early decommissioning of coal plants that is included in our estimates for energy transition investments.

The global number for the just transition follows IHLEG (2024) and is then allocated across countries based on coal workforce data from the Global Energy Monitor (2025) multiplied by GDP per capita, as a proxy for the proportionate country share.

Table 8 summarizes the estimated just transition finance requirements for EMDEs other than China. In 2022, total spending across all EMDEs amounts to roughly $10 billion (0.04% of GDP), translating to only about $1.90 per capita. By 2030, this rises to $40 billion (0.13% of GDP), and by 2035, to nearly $50 billion, reflecting higher absolute and per capita outlays while remaining at around 0.13% of GDP. Variations by region and income level are striking. Low-income countries see a percentage increase from 0.04% to 0.19% of GDP, although in absolute terms this remains modest given limited fiscal space and large informal workforces. Asia shows the largest jump in total spending, from $3.9 billion in 2022 to $17.3 billion in 2035, partly reflecting the region's reliance on coal. The Middle East experiences the steepest relative climb—from 0.03% to 0.20% of GDP—as fossil fuel-exporting nations seek to diversify their economies and strengthen social safety nets.

Table 8: The just transition spending and targets

Just transition annual spending	Percent of GDP			2022 USD per capita			8688.USD?billions		
	2022	2030	2035	2022	2030	2035	2022	2030	2035
All EMDEs	**0.04%**	**0.13%**	**0.13%**	**1.9**	**6.8**	**8.0**	**10.0**	**40.0**	**50.0**
Low income	0.00%	0.00%	0.00%	0.01	0.04	0.04	0.01	0.03	0.04
Lower middle income	0.02%	0.08%	0.08%	0.7	2.8	3.6	2.3	10.5	14.6
UMC + other EMDEs	0.06%	0.19%	0.20%	6.5	24.0	28.3	7.6	29.4	35.3
Africa	0.02%	0.05%	0.05%	0.4	1.0	1.0	0.6	1.8	2.0
Asia	0.03%	0.09%	0.08%	0.8	3.5	4.7	2.2	9.9	13.8
Europe & Central Asia	0.13%	0.41%	0.43%	14.8	58.2	70.5	6.9	27.4	33.2
Latin America	0.00%	0.01%	0.01%	0.4	1.3	1.5	0.2	0.9	1.0
Middle East	0.00%	0.00%	0.00%	0.00	0.00	0.00	0.01	0.02	0.03

Nature and sustainable agriculture

EMDEs currently dedicate about 0.1% of their GDP to biodiversity conservation. By 2035, this must rise to around 0.5% of GDP to meet Rio targets to halt biodiversity loss by ensuring that 30 per cent of land and sea is protected by 2030 and reach land degradation neutrality by 2030. Increasing funding to this level would help reverse the alarming decline of species and ecosystems, bolster climate resilience, and safeguard critical natural services—such as pollination, water filtration, and carbon sequestration. In doing so, it would also provide substantial co-benefits for rural livelihoods, local economies, and sustainable development.

Identifying priorities: The UNEP State of Finance for Nature reports (2023, 2024) provide detailed estimates on the required spending for nature-based solutions (NbS) to reach the specific global restoration targets of the UN Convention to Combat Desertification, the biological diversity targets to protect 30 percent of land and sea agreed to in the Kunming Montreal Global Biodiversity Framework and the forest and carbon sinks necessary to meet the UNFCCC targets on climate change.[22] Global land restoration commitments call for 1 billion hectares to be restored by 2030.

Costing investments: UNEP classifies NbS into three overlapping yet distinct categories—sustainable land management (SLM), restoration, and protection—offering a practical framework to highlight key investment priorities.

SLM includes practices such as agroforestry, optimal grazing, and cover cropping. These interventions enhance agricultural productivity while preserving essential ecosystem services, including carbon sequestration, improved soil fertility, and biodiversity preservation. Moreover, many SLM activities generate revenue through mechanisms like carbon markets or increased agricultural yields, making them attractive for private-sector investment.

Restoration efforts—such as reforestation and the rehabilitation of peatlands, mangroves, seagrass, and saltmarshes—typically require the highest per-hectare investment. High restoration costs reflect intensive input requirements and the economic opportunity costs associated with converting land from other uses.

Protection initiatives, including expanding protected areas, avoiding deforestation, and preventing ecosystem conversion, offer highly cost-effective biodiversity outcomes. While protection activities account for approximately 80% of the additional land area needed to achieve the global 30x30 target—protecting 30% of land and oceans by 2030—they require only about 20% of additional NbS finance. Their lower cost per hectare and rapid biodiversity benefits underscore the value of prioritizing protection efforts wherever feasible.

Effective biodiversity investments should balance sustainable land management, restoration, and protection activities to achieve maximum ecological health, economic benefits, and climate resilience.

Approximately half of the required investments will support restoration projects, notably reforestation and the rehabilitation of severely degraded peatland and mangrove ecosystems. These restoration efforts are critical to rebuilding carbon sinks, restoring habitat, and enhancing ecosystem resilience.

Around 20% of total biodiversity investment will focus on protection activities, such as expanding protected areas, avoiding deforestation, and conserving intact ecosystems. Protection remains a cost-effective method for preserving biodiversity and preventing further ecosystem degradation.

SLM will account for the remaining 30-35% of biodiversity finance, supporting interventions like agroforestry, improved grazing practices, and cover cropping to enhance rural livelihoods, soil health, and carbon sequestration. Implementing these interventions effectively also requires prioritizing social inclusion. Indigenous peoples and local communities must be recognized and supported as essential partners in biodiversity conservation through secure land tenure rights, community-led conservation initiatives, and alternative income opportunities.

EMDEs excluding China are estimated to have spent around $22 billion (0.1% of GDP, or roughly $4 per capita) to biodiversity conservation in 2022 (Table 9). We estimate, based on UNEP data, that this should rise to $176 billion by 2030 and $204 billion by 2035—representing a nearly tenfold rise in absolute terms.[b] Regional disparities are notable: Africa and low-income countries spend about 0.4% on biodiversity, while Latin America and the Middle East spend very low amounts and should increase by more than other regions. Asia, with its large population and extensive biodiversity hotspots, should spend the most on nature-based solutions and sustainable agriculture, reaching $75 billion annually by 2035.

[b] It is important to note that these estimates principally cover nature and biodiversity and do not include the full extent of likely investments needed in sustainable agriculture and degraded lands.

Table 9: Nature and sustainable agriculture spending and targets

Nature annual spending	Percent of GDP			2022 USD per capita			8688.USD?billions		
	2022	2030	2035	2022	2030	2035	2022	2030	2035
All EMDEs	**0.10%**	**0.58%**	**0.54%**	**4**	**30**	**33**	**22**	**176**	**204**
Low income	0.40%	0.88%	0.88%	3	8	9	2	7	9
Lower middle income	0.11%	0.64%	0.52%	3	23	25	11	89	99
UMC + other EMDEs	0.07%	0.52%	0.54%	8	65	77	9	80	96
Africa	0.36%	0.73%	0.76%	8	14	16	11	24	31
Asia	0.07%	0.64%	0.46%	2	27	26	5	75	75
Europe & Central Asia	0.06%	0.49%	0.54%	6	71	89	3	33	42
Latin America	0.03%	0.52%	0.59%	3	58	74	2	39	51
Middle East	0.05%	0.42%	0.47%	2	19	24	0	4	6

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