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SOCIAL DEVELOPMENT DIVISION

The Price of Inaction on Social Protection in Asia and the Pacific

A CGE Model for 27 Countries in Asia and the Pacific

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Table of Contents

Contents

Abstract

This technical paper, contributing to the 2024 Social Outlook, analyzes the price of inaction in social protection systems amidst escalating global challenges. Utilizing a global computable general equilibrium model alongside household-level microdata from 27 Asia-Pacific countries, it assesses how climate change, demographic shifts, and digitalization could exacerbate poverty if social protection measures are not sufficiently strengthened. The paper models various scenarios to estimate the expenditures necessary to mitigate these adverse impacts, providing a critical evidence base for enhancing social protection systems. The findings indicate that, under current social protection expenditure levels, poverty in the Asia-Pacific region is projected to rise due to factors such as climate change, an ageing population, and rapid digital advancements.

The analysis highlights the need for increased social protection investments to counteract this projected increase in poverty. It explores the policy adjustments and financial commitments required to effectively address the challenges posed by these megatrends. The paper underscores the urgency for governments to act decisively by enhancing social protection systems, investing in climate resilience, supporting healthy ageing, and embracing inclusive digitalization. It emphasizes that while the cost of inaction could be substantial by 2040, proactive investment in social protection now will reduce long-term costs and foster a more equitable and resilient future. The key message is clear: immediate action is crucial to prevent significantly higher costs and adverse effects in the future.

I: Introduction

The Social Outlook is a key publication of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), produced biennially to address critical social development issues within the Asia-Pacific region.

For the year 2024, the Social Outlook's central theme is "future-proofing social protection," focusing on adapting and enhancing social protection systems in response to the profound global megatrends that are reshaping societies. These megatrends include demographic transitions including population ageing, climate change, rapid digitalization, and a range of global complex shocks that have far-reaching implications for social stability and economic resilience.

In its forthcoming edition, the Social Outlook aims to analyze how these trends are impacting social protection systems and to project how these systems might need to evolve to maintain their effectiveness and relevance. The report will review key social development trends and evaluate the current state of social protection across the Asia-Pacific region. This includes assessing how different countries are faring in terms of social protection schemes – be they contributory or non-contributory - across the life cycle.

One of the primary objectives of this technical paper, which provides some critical inputs to the 2024 Social Outlook, is to examine the price of inaction the region may need to pay if not enough investment is made to strengthen social protection. It investigates how poverty might worsen if social protection measures are not adequately strengthened in the face of these global challenges. The paper uses a global computable general equilibrium model in conjunction with household-level microdata from 27 countries in Asia and the Pacific. This approach allows for a nuanced analysis of how three critical megatrends—climate change, demographic shifts, and digitalisation—affect poverty across these countries.

Furthermore, this technical report explores the necessary social protection expenditures required to counteract the adverse impacts of these megatrends. By modelling different scenarios and estimating associated costs, the report provides an evidence base for specific actions and strategies put forward by the Social Outlook that can help enhance the agility and resilience of social protection systems. The ultimate goal is to provide actionable recommendations that will support accelerated progress toward inclusive and sustainable development, ensuring that social protection systems are not only reactive but also proactive in safeguarding everyone against future uncertainties. These actionable recommendations are in the Social Outlook 2024 report to a large extent.[1]

This paper demonstrates that, given the current levels of social protection expenditure, poverty in the Asia-Pacific region is anticipated to increase due to a combination of factors including climate change, demographic shifts—particularly the ageing population—and the rapid advancement of digital technologies. The analysis further explores the extent to which social protection expenditures would need to be increased to effectively counteract this projected rise in poverty. By examining various scenarios and projections, the paper provides insights into the necessary policy adjustments and financial commitments required to mitigate the

[1] United Nations Economic and Social Commission for Asia and the Pacific (2024). Protecting our future today: Social protection in Asia and the Pacific. Social Outlook for Asia and the Pacific. ESCAP, Bangkok.

adverse impacts of these converging challenges on poverty levels.

This paper begins with an introduction outlining the context and relevance of the study, followed by a clear statement of objectives. It then delves into an exploration of the major megatrends impacting the Asia-Pacific region, including climate change, demographic transitions, particularly population ageing, and the rise of digital technologies. The methodology section details the approaches and tools used to analyze these trends. Building on this foundation, the paper presents various scenarios to project future impacts on poverty. Through a comprehensive analysis of the results, it evaluates how these megatrends might exacerbate poverty levels under current social protection expenditure levels. The paper concludes with recommendations on the necessary adjustments to social protection expenditures to effectively address and mitigate the anticipated rise in poverty.

II: Objectives

The objectives of this technical paper are to explore the following questions:

- What are the megatrends related to climate change, demographic transition and digitalization in Asia Pacific countries and how do they relate to prevailing social protection systems?
- What is the price of inaction due to shocks from climate change, demographic transition and digitalization in Asia Pacific countries?
- To what extent the negative impacts of the megatrends can be countered through improvements in social protection expenditures?

III: What are the megatrends related to climate change, demographic transition and digitalization in Asia Pacific countries?

Climate change

Achieving inclusive and sustainable development is becoming increasingly challenging due to the escalating impacts of climate change across Asia and the Pacific. Even if global warming is limited to the projected 1.5 degrees Celsius increase, which many experts believe may be exceeded, approximately 85 percent of the region's population is anticipated to face multi-hazard risks linked to climate change.[2] Current climate-related hazard hotspots are expected to expand or intensify, while new hotspots will emerge, further complicating the situation.

Individuals living in these vulnerable areas—often characterized by high poverty rates and limited access to infrastructure—will be subjected to more frequent and severe natural disasters. They will also be among the first to experience the gradual effects of climate change, including rising sea levels, increasing temperatures, and the impacts of adaptation and mitigation policies designed to address climate change.

The interplay between climate change and rising socioeconomic inequalities compounds the difficulties faced by marginalized communities. Those who are already in precarious situations—such as children, women, older persons, and individuals with disabilities—are particularly vulnerable. These groups frequently lack the resources and capacity to effectively manage complex shocks related to health, income, food security, and displacement. As such, climate change disproportionately affects these populations, highlighting the urgent need for adaptation and mitigation strategies that also address underlying inequalities.

Vulnerability to climate-change-induced events and the capacity to cope with them vary significantly both between and within countries. Inequities in access to essential services and infrastructure exacerbate these disparities, leading to reduced resilience and reinforcing long-standing inequalities. As demonstrated in the forthcoming Social Outlook 2024, in regions projected to experience intensified or emerging multi-hazard risks under a 2-degree Celsius global warming scenario, the inequality of opportunity is notably high.

The challenge of achieving inclusive and sustainable development is magnified by the dual pressures of climate change and rising inequalities. Addressing these issues requires a comprehensive approach that not only mitigates the effects of climate change but also ensures that adaptation measures are equitable and inclusive, effectively targeting the needs of the most vulnerable populations.

[2] United Nations Economic and Social Commission for Asia and the Pacific (2023). *Seizing the Moment: Targeting Transformative Disaster Risk Resilience*. ESCAP, Bangkok.

Demographic transition

The Asia-Pacific region is currently experiencing a youthful demographic profile, but this advantageous situation is rapidly changing. Many countries in the region have the opportunity to harness their demographic dividend if they act swiftly.[3] By establishing inclusive, sustainable, and comprehensive social protection systems now, these nations can capitalize on their youthful populations before the demographic landscape shifts significantly.

As societies age, the need for financially sustainable pension systems becomes increasingly critical. Adequate pensions are essential for protecting older adults from poverty and reducing the reliance on informal social protection mechanisms, often provided by family members. Well-structured pension systems not only safeguard elderly populations but also enhance labour market mobility and bolster the overall economy.

With the growing number of elderly individuals, the financial burden on the working-age population intensifies, straining economic resources. While increasing productivity, encouraging female labour force participation, and promoting healthy and active ageing can alleviate some pressure, these measures may not fully address the challenges in regions where employment quality is poor, underemployment is high, and decent job opportunities are scarce. In response to these issues, several countries in the Asia-Pacific region are reforming their pension systems by extending contributory schemes and introducing or expanding social pensions.[4]

Women, who generally live longer than men, often face additional challenges. Despite a longer life expectancy, women frequently experience a larger gap between life expectancy and healthy life expectancy. This discrepancy is exacerbated by women's limited access to pensions and social security, leaving them more financially vulnerable in old age. Furthermore, with aging populations, the demand for informal and often unpaid caregiving—predominantly provided by women—is expected to rise. Balancing caregiving responsibilities with work can diminish women's labour force participation, increasing their financial dependence and the likelihood of experiencing poverty in old age.

The rapid pace of population ageing will place additional financial burdens on individuals and healthcare systems. While longer lifespans are generally positive, the associated decrease in labour force participation and heightened demand for healthcare and social protection necessitate urgent policy interventions. Costs for health and long-term care are expected to escalate due to the higher incidence of disabilities and chronic diseases among the growing elderly population, making it crucial to address these challenges proactively.

The demographic transition in the Asia-Pacific region has profound implications for public budgets. As the number of older individuals grows and the working-age population—and consequently the taxpayer base—shrinks, countries face increasing financial pressures. While raising retirement ages, promoting healthy ageing, and expanding formal employment can help mitigate some effects, the rise in public expenditure on healthcare, pensions, and long-term care will likely impact other public sectors.

[3] https://www.population-trends-asiapacific.org/

[4] International Labour Office, World Social Protection Report 2024-2026 92024). *Universal Social Protection for Climate Action and a Just Transition*. International Labour Office, Geneva.

Digitalization

Recent advancements in connectivity across Asia and the Pacific indicate that there is a solid digital foundation that countries could leverage to develop and enhance digitalized social protection systems.[5] The region's progress in digital infrastructure provides a promising base for integrating technology into social protection, potentially transforming how these systems are designed and delivered.

However, the integration of digital technologies into social protection systems presents both opportunities and challenges. The effectiveness of digitalized social protection relies heavily on ensuring digital inclusion for all individuals. This includes promoting digital literacy and ensuring that digital devices are both affordable and accessible. Despite the progress in connectivity, significant gaps in digital inclusion remain throughout the region. These gaps can hinder the equitable distribution and effectiveness of digital social protection systems.

The rapid advancement of technology presents an opportunity to revolutionize social protection systems. Innovations in digital technology have the potential to significantly improve the efficiency and reach of these systems. The COVID-19 pandemic has accelerated this transformation, highlighting the benefits of digitalization. The automation of processes such as registration, enrollment, beneficiary identification, payments, and outreach has made social protection schemes more accessible and efficient. These advancements demonstrate the potential of digital solutions to streamline and enhance the delivery of social protection services.

To fully harness the benefits of digitalization, however, efficient and affordable information and communication technology (ICT) infrastructure is essential. Access to mobile broadband services and other ICT resources will be crucial in expanding digital inclusion and ensuring that digitalized social protection systems can effectively reach and support those who are most marginalized. Without robust ICT infrastructure, the full potential of digital social protection systems may not be realized, leaving some individuals and communities behind.

While the progress in digital connectivity offers a strong foundation for the development of digitalized social protection systems in Asia and the Pacific, addressing gaps in digital inclusion and enhancing ICT infrastructure are critical steps. By focusing on these areas, countries can ensure that the benefits of digitalization extend to all individuals, thereby strengthening the effectiveness and reach of social protection systems and supporting more inclusive development.

[5] https://www.unescap.org/sites/default/d8files/event-documents/2400281E.pdf

IV: Methodology

This paper uses the Global Trade Analysis Project (GTAP) model and disaggregated household data to simulate scenarios related to climate change, demographic transition, and digitization.

The GTAP model

In the current study, we employ the GTAP model (Hertel, 1997). The GTAP model is a global general equilibrium model. It covers not a single country or a select group of countries, but the whole world. Unlike a partial equilibrium model, the GTAP model doesn't confine itself to one sector, or a small group of sectors; unlike a macroeconomic model, it does not treat all production and consumption as being of a single good, or a very small number of stylized goods (exportable and importable, or tradable and non-tradable). Instead, it represents an economy of many goods, produced by many sectors.

GTAP is a comparative static model. A GTAP simulation presents not changes through time, but differences between different possible states of the global economy —a base case and a policy case—at a fixed point in time, or with respect to two points in time (base period vs. a future projection period).

GTAP rests on an input-output accounting framework. The framework is complete, in that all sources and uses of each economic good are accounted for, as are all inputs into production. Wherever a cost is incurred, or a benefit obtained, it is accounted for as usage of specific products or primary factors. The standard model is also widely used in real-time policy analysis as well as serving as the basis for many specialized extensions.

The standard GTAP model is implemented using the GEMPACK suite of economic modelling software (Harrison and Pearson, 1996). As usual in GEMPACK, the equations of the model are recorded not in levels but in percentage change form. However, despite its apparently linear representation, the model is non-linear due to the formulae and update equations, which result in changes in the underlying shares and price elasticities. Its solution requires non-linear methods.

The use of the percentage change representation complicates simple equations and simplifies complicated behavioural equations. In the simple, adding-up equations (e.g., market clearing), new share coefficients appear; in behavioral equations, complicated expressions involving intensity parameters are replaced again by simple share coefficients. These share coefficients are calculated from a database comprised of input-output and trade accounts, expressed in monetary values.

As the intensity parameters disappear, so too does the need to calibrate them. And since the database already represents a set of world economic accounts, the solution of the model does not entail creating a representation of a state of the world but discomposing a representation of one state to obtain an alternative state.

The closure, or partition of the variables into endogenous and exogenous components, is not fixed in the theoretical structure, but set by the user for each simulation. Different closures may be used to represent different economic environments or for different lengths of run. For a short-run simulation, for instance, one might fix the wage rate, while for a long-run simulation, the level of employment might be fixed.

Almost everywhere, the theoretical structure derives from optimizing behaviour by agents such as firms and households. Households maximize utility, firms minimize costs, and all agents are price takers. The model adopts the fiction of a representative agent:

the household sector consists of infinitely many identical infinitesimal households, an industry of infinitely many identical infinitesimal firms so that each sector has the budget shares or input-output ratios of its component agents. All equations in the model display price homogeneity: for any given solution, an alternative solution may be found by scaling all price and money value variables by a common factor, while holding quantity variables fixed. Under standard closures, exactly one price variable is held fixed; all other prices are evaluated relative to this numéraire. The theoretical structure therefore displays the neoclassical dichotomy between real variables and relative prices on the one hand, and the price level on the other hand.

Consistent with the assumption of constant returns to scale, the standard model likewise displays quantity homogeneity. The price and quantity homogeneity conditions provide useful checks on theoretical modifications of the model. As the model has nothing useful to say about price levels, it does not incorporate multiple currencies. The GTAP Data Base is denominated in millions of base year US dollars. In simulations with a numéraire, price variables are in effect prices relative to that numéraire; in other simulations, interpretation is a task for the user. In the standard model, all taxes are expressed in ad valorem form; given the indeterminacy of the price level, attempts to introduce specific rate taxes entail adding more information to the database. Related to the need for an exogenously set price level is Walras' law, applicable to a large class of general equilibrium models, under which equilibrium in all but one of the markets in the model implies equilibrium in the last market. One market-clearing condition should therefore be omitted; in GTAP this is the market for investment funds. The model therefore does not explicitly impose equality between global saving and global investment expenditure, but merely records divergence between them; this should be endogenously zero. Computationally significant deviations from zero indicate errors in the theoretical structure or imbalances in the data.

A regional household allocates regional income between private consumption, government consumption and saving to maximize the theoretical construct of regional utility. This unitary regional utility function, together with the reliance on optimizing behaviour and the care taken numerically to balance the database, supports a rigorous welfare decomposition, distinguishing endowment, technological and allocative efficiency effects, divided into detailed subclasses.

For the form of the private demand system, the most common choice in applied general equilibrium modelling is perhaps the linear expenditure system *(LES). GTAP provides also the option of sluggish factors—mobile, but not perfectly mobile, between industries, according to some elasticity of transformation which can be calibrated to reproduce observed factor supply responses.*

The two-level system of substitution between products from different sources—an import-domestic substitution nest above an import-import substitution nest—helps trade policy analysts display both limited import penetration from tariff reductions, by setting the import-domestic substitution elasticity relatively low, and modest terms of trade losses from unilateral tariff reforms, by setting the import-import substitution elasticity at a higher level.

Social Protection Online Tool (SPOT) Simulator[6]

The Social Protection Online Tool (SPOT) Simulator is a comprehensive, interactive and user-friendly platform designed by ESCAP to provide access to critical information on the potential impact of social protection on poverty and inequality across Asia and the Pacific. This robust tool serves as a valuable resource for policymakers, researchers, and practitioners by offering a centralized repository of data and insights related to social protection programs and policies.

The ESCAP SPOT Simulator estimates the impact of introducing a social protection scheme on poverty, inequality and consumption using household-level microdata from a number of Asia Pacific countries. The impact can be estimated for rural and urban households, as well as for different income groups and family configurations. It also computes the cost of simulated programmes, providing different illustrative options to expand fiscal space for social protection. Users can design social protection schemes in a country by setting parameters related to eligibility criteria, coverage levels and benefit amounts. The Simulator allows the user to analyze one scheme at a time or to combine different schemes and build a customized social protection package. In addition to simulating the impact in one country, users can compare social protection schemes of their choice within and across different countries.

The reduced-form microdata, derived from Household Income and Expenditure Surveys across the 27 countries, is featured on the Social Protection Simulator. This tool uses the household per capita expenditure data to estimate headcount poverty rates in each country. By applying the updated per capita expenditure data and adjusted poverty lines, the simulator offers a comprehensive view of how poverty rates are expected to change under different *economic scenarios, enhancing the accuracy and relevance of poverty analysis in the region.*

Overall, the SPOT Simulator is an essential resource for enhancing the understanding and development of social protection systems. By providing detailed, up-to-date information and facilitating comparative analysis, it supports efforts to design and implement effective and inclusive social protection policies worldwide.

[6] https://spot.unescap.org/

A step-by-step approach to link results from the GTAP model to the household data of SPOT

Step 1: We use the GTAP version 11 database to make country aggregation so that 27 countries of the SPOT Simulator are mapped with the country classification from the GTAP 11 database. The mapping is presented in Table 1.

To analyze the sectoral impacts of the cost of inaction, we utilize a GTAP model that aggregates commodities into ten distinct sectors. These sectors are: Grains and Crops, Livestock and Meat Products, Mining and Extraction, Processed Food, Textiles and Clothing, Light Manufacturing, Heavy Manufacturing, Utilities and Construction, Transport and Communication, and Other Services. This detailed sectoral breakdown allows us to assess how different economic areas are affected by various scenarios of inaction, providing a clearer picture of the broader economic consequences.

In linking micro household data from the SPOT simulator to the GTAP simulation results, we classify the labour force into five categories. These include two types of skilled labour—Technicians/Professionals and Officials/Managers—and three types of unskilled labour—Clerks, Service/Shop Workers, and Agricultural and Other Unskilled Labor. This classification helps us understand how changes in economic conditions impact different types of workers and their respective contributions to the economy.

Additionally, the GTAP model incorporates three other key factors of production: Capital, Land, and Natural Resources. By integrating these factors into the model, we can capture a comprehensive view of how various forms of production and resource use are influenced by the costs associated with inaction. This holistic approach enables a nuanced analysis of the economic impacts across different sectors and labour categories, informing more effective policy responses and strategic interventions.

Step 2: We apply a global comparative static Computable General Equilibrium (CGE) model, namely the GTAP model. The aggregated database is opened in RunGTAP[7] and is prepared for running simulations. The following simulations are considered:

- To account for the varying impacts of climate change shocks across different countries, a negative shock is applied to the productivity parameter of capital stock in the GTAP model. This adjustment is designed to replicate the anticipated decrease in annual average GDP as a percentage due to global warming. By incorporating this shock, we can better understand and quantify the economic losses associated with climate change across diverse national contexts.

- Demographic transition shocks are analyzed with attention to their varying impacts across different countries. In the GTAP model, these shocks are reflected through changes in both the growth and composition of the labor force, as well as adjustments to productivity parameters. This approach allows for a detailed examination of how shifts in demographics influence economic performance and productivity at a country-specific level.

- Digitalization shocks are analyzed to reflect their varying impacts across different countries. In the GTAP model, these shocks are represented by changes in the productivity parameters for both labour and capital. This approach allows for a nuanced

[7] RunGTAP is a visual interface to various GEMPACK programs. RunGTAP allows the user to run simulations interactively in a Windows environment using the GTAP general equilibrium model. See GTAP Models: RunGTAP (purdue.edu)

understanding of how digitalization affects economic productivity on a country-by-country basis.

The results of the GTAP model can be found at the macro, sectoral, and factor of production level. Our primary interest is to look at the returns to the five categories of labour which are used to link to the micro-data at the country level.

Step 3: The household-level microdata from 27 countries in Asia and the Pacific are meticulously organized to be integrated with the results of the Global Trade Analysis Project (GTAP) model. This integration enables detailed and dynamic poverty analysis using two distinct sets of results derived from the GTAP model.

In the first step of the poverty calculation process, the GTAP model provides percentage changes in remuneration for five distinct categories of labor. These changes are applied to update the per capita income or expenditure figures for household members. By reflecting the shifts in labour income, this adjustment offers a more accurate depiction of household economic conditions under the new economic scenarios modelled by GTAP.

The second step involves updating the poverty line income using the percentage change in the GDP deflator, which is also derived from the GTAP model. The GDP deflator adjusts the nominal values to account for inflation, thereby providing a more accurate measure of real income changes and their impact on poverty thresholds.

The organization of the household-level microdata facilitates this analysis by categorizing households into five occupational types that align with the five labour categories used in the GTAP model. This alignment ensures that the changes in labour remuneration are appropriately matched to the corresponding household data.

Once the per capita expenditure figures for each household are updated based on the changes in labour income, these figures are compared to the adjusted poverty line incomes to recalculate poverty rates. This recalculation provides a new measure of poverty that reflects the updated economic conditions. The updated poverty rates are then compared to the base rates to determine the changes in poverty levels.

Table 1 Mapping of SPOT countries with GTAP database

SPOT countries	GTAP 11 database countries
Armenia	Armenia
Bangladesh	Bangladesh
Bhutan	Bhutan's data is merged in the "Rest of South Asia" category. We will use "Rest of South Asia" as a proxy for Bhutan.
Cambodia	Cambodia
Cook Islands	Cook Islands' data is merged in the "Oceania Island Countries" category. We will use "Oceania Island countries" as a proxy for the Cook Islands.
Georgia	Georgia
India	India
Indonesia	Indonesia
Kiribati	Kiribati's data is merged in the "Oceania Island Countries" category. We will use "Oceania Island countries" as a proxy for Kiribati.
Kyrgyzstan	Kyrgyzstan
Lao People's Democratic Republic	Lao People's Democratic Republic
Maldives	Maldives' data is merged in the "Rest of South Asia" category. We will use "Rest of South Asia" as a proxy for Maldives.
Marshall Islands	Marshall Islands' data is merged in the "Oceania Island Countries" category. We will use "Oceania Island countries" as a proxy for Marshall Islands.
Federated States of Micronesia	Federated States of Micronesia's data is merged in the "Oceania Island Countries" category. We will use "Oceania Island countries" as a proxy for Micronesia.
Mongolia	Mongolia
Myanmar	Myanmar's data is merged in the "Rest of Southeast Asia" category. We will use "Rest of Southeast Asia" as a proxy for Myanmar.
Nepal	Nepal
Pakistan	Pakistan
Palau	Palau's data is merged in the "Oceania Island Countries" category. We will use "Oceania Island countries" as a proxy for Palau.
Philippines	Philippines
Sri Lanka	Sri Lanka
Thailand	Thailand
Tonga	Tonga's data is merged in the "Oceania Island Countries" category. We will use "Oceania Island countries" as a proxy for Tonga.
Türkiye	Türkiye
Uzbekistan	Uzbekistan
Vanuatu	Vanuatu's data is merged in the "Oceania Island Countries" category. We will use "Oceania Island countries" as a proxy for Vanuatu.
Viet Nam	Viet Nam

Source: GTAP 11 database and SPOT.

V: Scenarios

Climate change scenarios

Two different scenarios related to the price of inaction in the context of climate change are considered using data from the annual average losses from the Asia-Pacific Risk and Resilience Platform.[8] In the GTAP model, we shock the parameter related to the productivity of capital stock in a way so that the numbers of percentage loss in GDP for 27 countries in the GTAP model match with those from the Asia-Pacific Risk and Resilience Platform Report. Therefore, the climate change shocks involve the following two scenarios:

Scenario 1.1: Global average temperatures rise by 1.5 degrees Celsius as of 2040

Scenario 1.2: Global temperatures rise by 2 degrees Celsius as of 2040

[8] United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) (2024), Asia-Pacific Risk and Resilience Platform 2.0. Accessed on 27 March 2024.

Demographic transition scenarios

In examining the price of inaction in the context of demographic transition, we consider two distinct scenarios that highlight the financial implications of failing to address ageing-related changes in total healthcare expenditures. Our analysis draws on data from a technical paper commissioned by ESCAP in support of 2022 Social Outlook, namely "The Impact of Ageing on Accessibility, Affordability, and Availability of Healthcare Services in Asia and the Pacific."[9]

Specifically, we utilize information from Appendix A, which details baseline assumptions and healthcare expenditure (HCE) as a percentage of GDP, and Appendix D, which presents baseline assumptions without adjustments for healthy ageing. By comparing the projected HCE as a percentage of GDP for the year 2040 with the current HCE levels in 2020, we can estimate the potential economic impact of not increasing HCE to the projected 2040 levels.

The difference in HCE percentages between 2040 and 2020 represents the percentage of GDP that will be at risk if current expenditure levels are maintained without adjustment. This shortfall in HCE is expected to lead to reduced labour productivity, thereby contributing to a decrease in GDP. To quantify this impact, we incorporate these findings into the GTAP model.

In the GTAP model, we simulate the effect of this potential loss in GDP by adjusting the productivity of all five labour categories accordingly. This adjustment aims to align the GDP loss projected from the healthcare expenditure data with the productivity shocks modelled in GTAP. By doing so, we can better understand how insufficient healthcare expenditure could affect overall economic performance and labor *productivity, providing valuable insights into the economic costs of inaction in the face of population aging.*

Scenario 2.1: Percentage loss in GDP in 2040 if healthcare expenditures are not increased in proportion to GDP from 2020 to 2040 as populations age in a healthy manner

Scenario 2.2: Percentage loss in GDP in 2040 if healthcare expenditures are not increased in proportion to GDP from 2020 to 2040 as populations age in an unhealthy manner

[9] Daniel Howdon, and Selsah S. Pasali (2022). "The impact of ageing on accessibility, affordability and availability of healthcare services in Asia and the Pacific". Social Development Division Working Paper ESCAP/6-WP/50, June 2022. ESCAP, Bangkok.

Digitalization scenarios

To assess the potential economic impact of failing to enhance ICT productive capacity, we employ coefficients derived from a cross-country econometric regression. In this analysis, per capita GDP is used as the dependent variable, while the UNCTAD ICT Productive Capacity Index serves as the explanatory variable.[10] This approach enables us to estimate the percentage loss in GDP that a country might incur if it does not improve its current ICT productive capacity, despite having set a target to achieve a higher per capita income level.

Specifically, we focus on countries with varying income levels. For low- and lower-middle-income countries aiming to reach the upper-middle-income threshold, and for upper-middle-income countries targeting the high-income category, we project the GDP losses associated with failing to meet their ICT capacity improvement goals. The assumption underlying this analysis is that higher ICT productive capacity correlates with higher income levels; thus, not advancing ICT capacity represents a missed opportunity for economic growth.

In this framework, some countries may successfully enhance their ICT productive capacity to meet their targets, while others may fall short. For those countries that do not achieve the desired level of ICT capacity, the anticipated economic loss stems from decreased productivity in both labour and capital. This reduction in productivity translates into a tangible loss in GDP, reflecting the economic potential that is not realized due to insufficient investment in ICT infrastructure.

To integrate these findings into the GTAP model, we adjust the productivity parameters for labour and capital. These adjustments are made to ensure that the GDP loss modelled in GTAP aligns with the GDP loss estimated from the cross-country regression. By shocking the productivity parameters to reflect the calculated GDP loss, the GTAP model can more accurately represent the economic consequences of inadequate ICT productive capacity and provide insights into how such deficiencies impact overall economic performance.

Scenario 3.1: Change in GDP by 2040 if countries improve their ICT productive capacity index in the following manner: countries below the Asia-Pacific average (according to the latest year with available data[11]) in ICT productive capacity index progress to the regional average, while countries which are above regional average come closer to the frontier countries like China, Korea, Japan, Hong Kong, China, Macau, China, and Singapore, and the gap between the improvement and the desired level of ICT productive capacity index that could help them reach a certain level of targeted per capita income.

Scenario 3.2: Change in GDP by 2040 if countries improve their ICT productive capacity index based on conservative country-specific trend (business-as-usual) and the gap between the business-as-usual improvement and the desired level of ICT productive capacity index that could help them reach a certain level of targeted per capita income.

[10] Population size and openness (trade to GDP ratio) appear as control variables.
[11] https://unctad.org/topic/least-developed-countries/productive-capacities-index

A summary of scenarios with transmission mechanisms

Table 2 summarizes the scenarios, and the transmission mechanisms (chain of developments) used to estimate changes in poverty at the respective national poverty lines and the need for spending.

Table 2 Megatrend scenarios and transmission mechanisms

Megatrend	Scenarios	Transmission mechanisms
Climate change	1.1. Global average temperatures rise by 1.5 degrees Celsius as of 2040. 1.2. Global temperatures rise by 2 degrees Celsius as of 2040.	**Capital productivity**: A negative shock is imposed on the parameter of productivity of capital stock in the GTAP model to generate a similar decrease in annual average loss as a percentage of GDP anticipated due to global warming.
Demographic shifts, including ageing	2.1. Populations age in a healthy manner from 2020 to 2040 implying a relatively modest increase in total health care expenditures, taking into account the pace of ageing and adjusting for healthy ageing. 2.2. Populations age in an unhealthy manner from 2020 to 2040 implying a significant increase in total healthcare expenditures, taking into account the pace of ageing with no healthy ageing adjustment.	**Labour productivity:** As the economies experience a rise in the aged population and a declining demographic dividend and if the health sector is not developed, then both the aged population and young population become deprived of critical health services, which undermines the improvement in labour productivity and thus results in loss in GDP. The difference in expenditures with and without healthy ageing is treated as the percentage of GDP which would be lost in 2040 if current healthcare expenditures were not raised to levels sufficient to meet the demand for health services expected in 2040.
Digitalization	3.1. Countries improve significantly their productive capacity in ICT (ICT Productive Capacity Index level) catching up to the regional average at least. This contributes to faster economic growth and higher incomes. 3.2. Countries improve their productive capacity in ICT (ICT Productive Capacity Index level) in line with their recent trends which leads to the limited positive impact of digitalization on economic growth and higher incomes.	**Capital and labour productivity:** The loss in GDP under this scenario is driven by the lower level of productivity in labour and capital. The rationale behind this assumption is operationalized with cross-country growth regressions where high ICT capacity predicts higher income. When countries do not improve their ICT capacity relative to a benchmark, they fall short of raising their per capita income. The productivity parameters of labour and capital in the GTAP model are negatively shocked causing a decline to the extent that the loss in GDP from the GTAP model matches the calculated loss in GDP from the cross-country regressions.

Sources: The climate change scenario relies on estimates of annual average loss as a percentage of GDP from the ESCAP Asia-Pacific Risk and Resilience Platform accessed on 27 March 2024. The demographic shift scenario relies on ESCAP projections on healthcare expenditures with or without healthy ageing as elaborated in ESCAP (2022). The digitalization scenario relies on the Productive Capacities Index, specifically its information and communication technology (ICT) component accessed on 27 March 2024, developed by the United Nations Conference on Trade and Development.

VI: Analysis of Results

Climate change scenarios

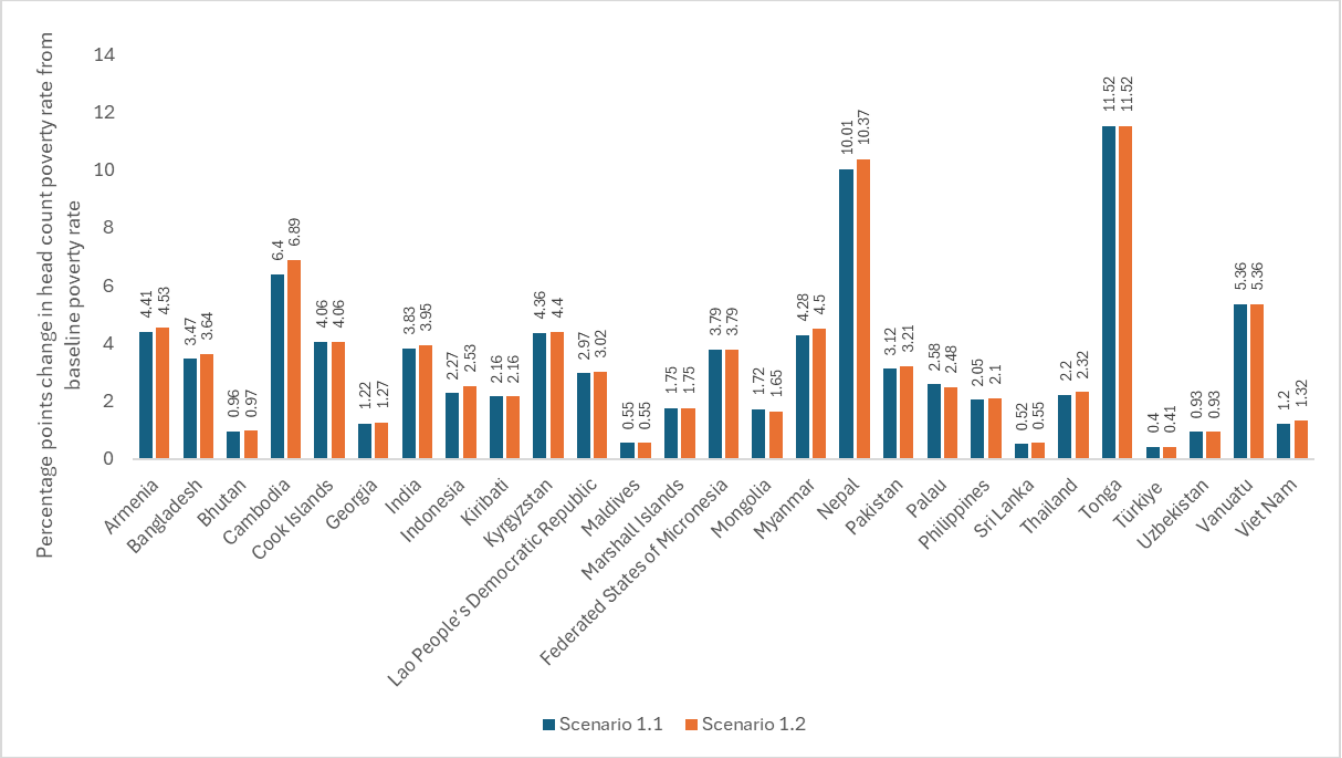
Figure 1 illustrates the projected changes in the headcount poverty rate, measured in percentage points, from baseline levels under three different climate change scenarios. The data reveals that poverty headcount is expected to rise more significantly under a 2-degree Celsius warming scenario compared to other scenarios. Tonga would appear to be the most affected country while Türkiye would appear to be the least affected one.

According to the UN World Population Prospects 2022, which provides population projections for 2040 across the 27 countries analyzed, the number of individuals living in poverty is projected to increase substantially. Specifically, under Scenario 1.1, an additional 100.6 million people (or 3.3 percent of the total population in these 27 countries) are expected to fall below the poverty line. Under Scenario 1.2, this figure rises to 104.6 million people, representing 3.4 percent of the total population in 2040.

The impact of climate change on poverty varies significantly by country. Tonga is projected to experience the largest increase in poverty, closely followed by Nepal. This is consistent with findings from the Asia-Pacific Risk and Resilience Platform, which indicates that Tonga will face the most severe decline in GDP due to rising temperatures. Nepal is also expected to encounter a substantial reduction in GDP, further exacerbating poverty conditions.

In addition to the direct impacts of climate change on GDP, the concentration of vulnerable populations near the poverty line plays a crucial role in shaping poverty outcomes. Many individuals who are just above the poverty threshold are highly susceptible to falling into poverty as a result of economic shocks or adverse climate impacts. These vulnerable populations, already precariously close to the poverty line, may be pushed into poverty by even modest negative changes in economic conditions.
Overall, the results underscore the significant potential for increased poverty under both scenarios of climate change, highlighting the urgent need for targeted interventions and adaptive measures to mitigate the adverse effects on the most vulnerable populations.

Figure 1 Climate change scenarios and headcount poverty



Source: Author's calculations based on the GTAP model and household income and expenditure surveys from 27 countries available in the ESCAP Social Protection Simulator.

Demographic transition

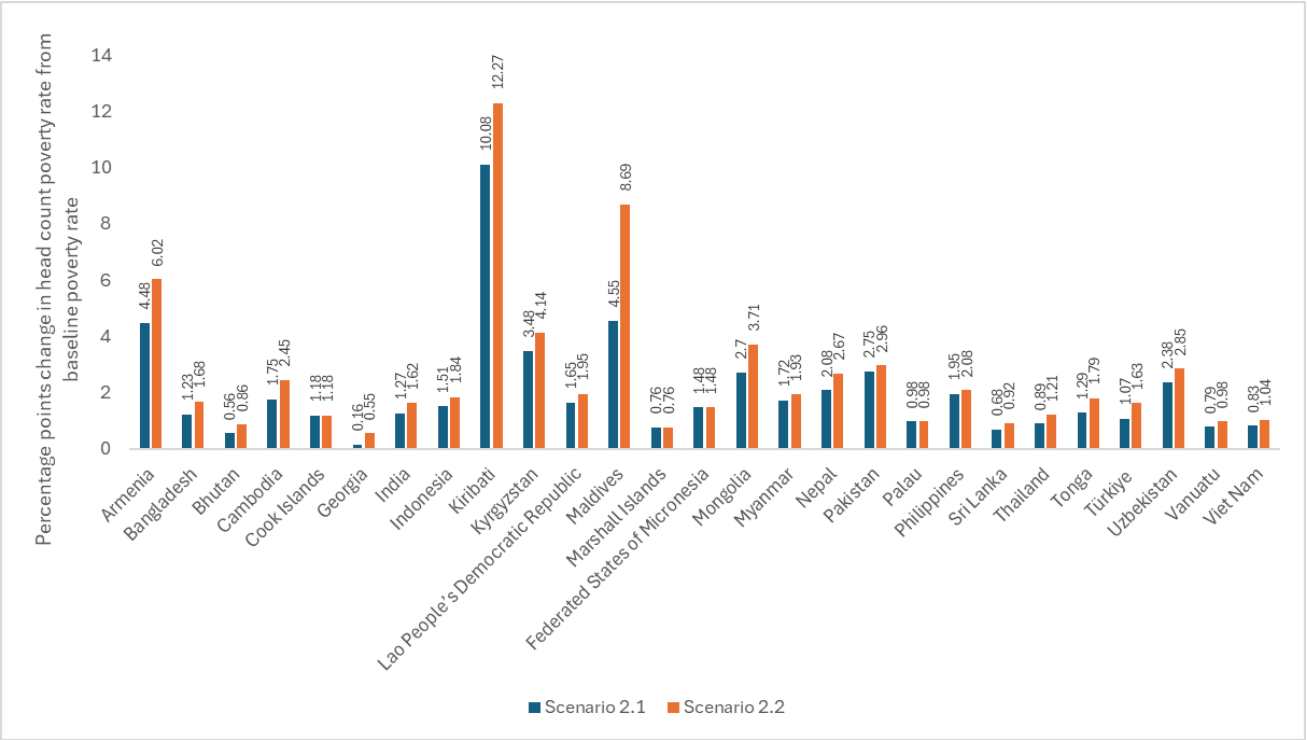
Figure 2 illustrates the projected changes in the headcount poverty rate, measured in percentage points, from baseline levels under two distinct demographic change scenarios. The analysis shows a more pronounced increase in poverty under Scenario 2.2, which does not account for healthy ageing, compared to Scenario 2.1, which includes considerations for populations in Asia and the Pacific ageing in a healthy manner. Kiribati would appear to be the most affected country while Bhutan would appear to be the least affected one.

According to population projections for 2040 across the 27 countries analyzed, Scenario 2.1—assuming healthy ageing—is expected to result in an increase of 45.7 million people living in poverty, which represents 1.5 percent of the total population of these countries. In contrast, Scenario 2.2, which does not incorporate healthy ageing effects, projects a significantly higher increase of 56.1 million people in poverty, or 1.8 percent of the total population.

The data highlights that the most substantial rise in poverty rates is anticipated in Kiribati, followed by the Maldives. These countries are expected to experience the greatest deterioration in poverty levels due to demographic changes. The impact of demographic shifts without the benefits of healthy ageing exacerbates the vulnerability of these populations, underscoring the critical importance of health interventions to mitigate the negative effects of ageing on poverty.

The findings from Figure 2 emphasize that incorporating healthy ageing into demographic projections can significantly influence poverty outcomes. Without such considerations, the increase in poverty is markedly higher, particularly affecting countries like Kiribati and the Maldives. These results stress the need for comprehensive policies that address both demographic changes and health improvements to manage and reduce poverty effectively. The introduction of universal healthcare in Maldives is a solid step in the right direction. Moving forward, monitoring and evaluating this policy reform from a healthy ageing perspective is crucial given that the size of the population is small, and it is ageing rapidly.

Figure 2 Demographic change scenarios and headcount poverty



Source: Author's calculations based on the GTAP model and household income and expenditure surveys from 27 countries available in the ESCAP Social Protection Simulator.

Digitization

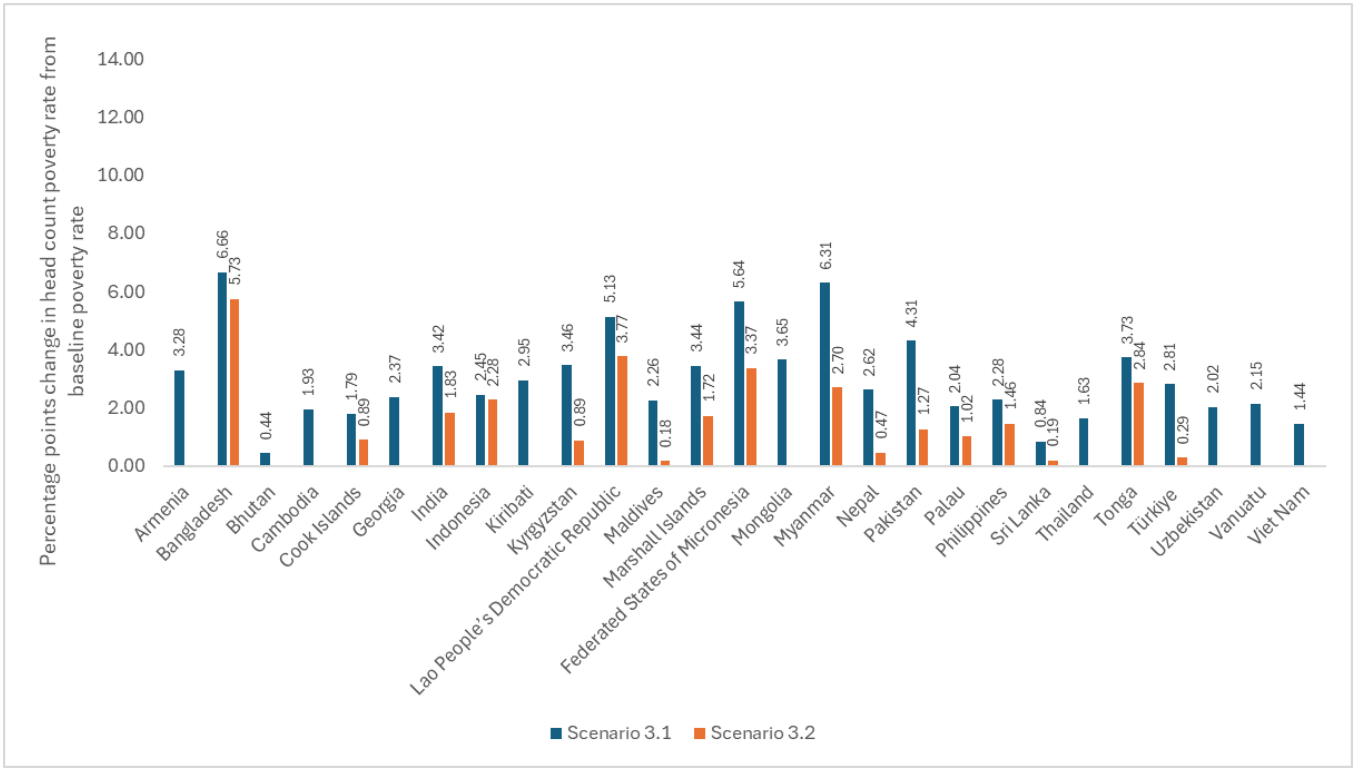
Figure 3 illustrates the projected changes in the headcount poverty rate, expressed in percentage points, from baseline levels under different digitization scenarios. The figure contrasts two distinct scenarios related to the impact of digitization on poverty rates in the year 2040. Bangladesh would appear to be the most affected country while Bhutan would appear to be the least affected one.

In the first scenario, which assumes significant advancements in ICT-related productive capacities, the projection shows that the number of people living in poverty across the 27 countries would increase by 53.5 million, or 1.8 percent of the total population in 2040. This scenario reflects a positive outcome where substantial improvements in digital infrastructure and capacity help mitigate the rise in poverty.

In contrast, the second scenario, which assumes no significant enhancement in ICT productive capacities, projects a much larger increase in poverty. Under this scenario, the number of people living in poverty would rise by 105.5 million, or 3.5 percent of the total population in 2040. This scenario highlights the severe impact of stagnating or insufficient progress in digitization, resulting in a more pronounced increase in poverty levels.

The data underscores the crucial role of digital advancements in shaping poverty outcomes. Significant improvements in ICT productive capacities can substantially reduce the negative impact on poverty rates, while the lack of progress in this area can exacerbate poverty challenges through negative impacts on both labour and capital productivity. Therefore, leaving no one behind in digitalisation is key. This comparative analysis emphasises the importance of investing in digital infrastructure and capabilities to effectively combat poverty and support sustainable development.

Figure 3 Digitalization scenario and headcount poverty



Source: Author's calculations based on the GTAP model and household income and expenditure surveys from 27 countries available in the ESCAP Social Protection Simulator.

Combined scenario

As all megatrends are impacting the region simultaneously, a combination of scenarios associated with each megatrend is used to estimate the rise in poverty. Two combined scenarios are considered:

- **Optimistic Scenario**: This scenario assumes a 1.5-degree Celsius increase in global temperatures, that populations age in a healthy manner, and significant improvements are made by countries in ICT productive capacity by 2040. Under this scenario, the projected increase in poverty by 2040 is 199.8 million people or 6.5% of the total population in the Asia-Pacific region.

- **Pessimistic Scenario**: In contrast, the pessimistic scenario assumes a 2.0-degree Celsius increase in global temperatures, no progress in healthy ageing, and insufficient advancements in ICT productivity. Here, the poverty headcount is projected to increase by 266.1 million people or 8.7% of the total population.

Figure 4 illustrates the projected impact of both optimistic and pessimistic scenarios on the headcount poverty ratio across three major megatrends. The analysis highlights how different future scenarios might influence poverty rates in 2040 for the 27 countries under consideration.

In the optimistic scenario, which assumes favourable conditions and effective responses to the megatrends, the greatest increase in poverty headcount is projected to occur in Tonga, followed by Nepal and Kiribati. This scenario envisions a situation where, despite positive conditions, these countries face the largest relative increases in poverty.

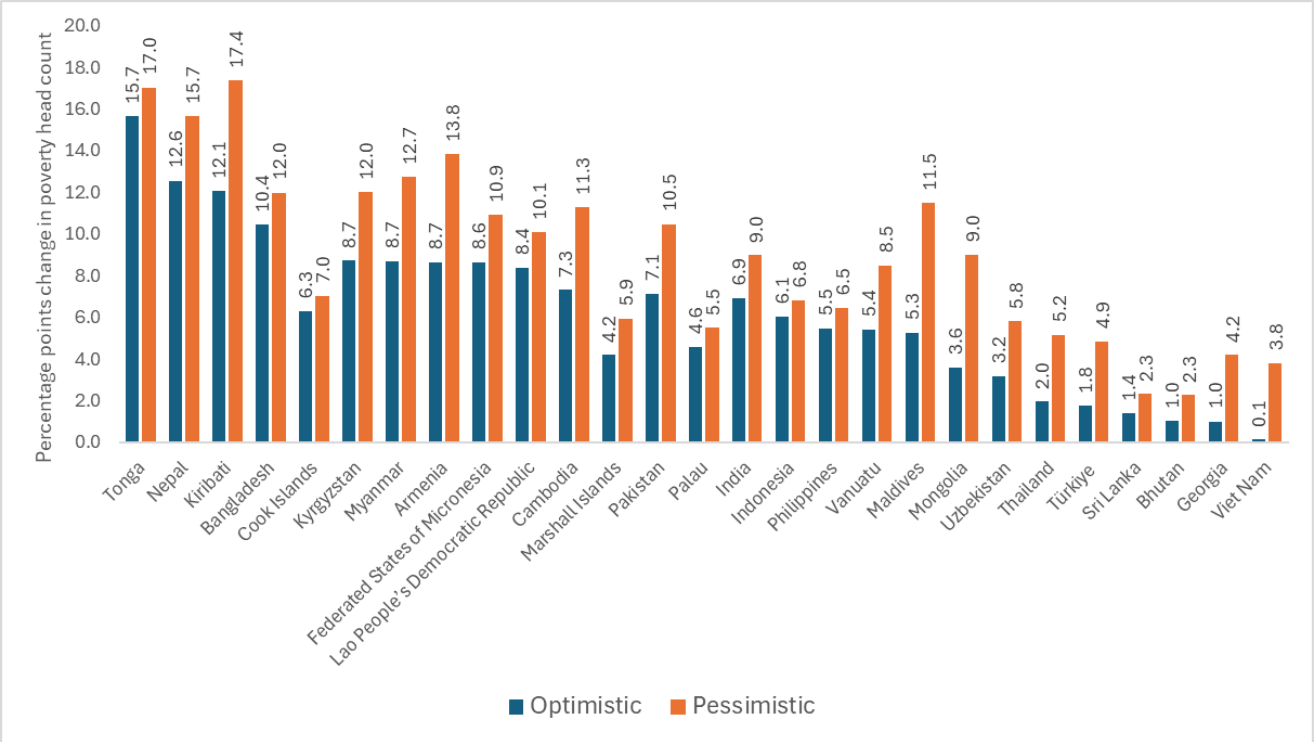
Conversely, under the pessimistic scenario, where adverse conditions and inadequate responses prevail, the most significant rise in poverty headcount is anticipated in Kiribati, followed by Tonga and Nepal. This scenario reflects a more severe outlook, where these countries experience the most substantial increases in poverty due to unfavourable conditions and ineffective mitigation strategies.

The impact of these scenarios also varies across different countries. In the optimistic scenario, Viet Nam is expected to see minimal changes in its poverty rates, indicating relative stability compared to other nations. On the other hand, under the pessimistic scenario, Bhutan and Sri Lanka are projected to experience the least significant changes in poverty levels, though they will still face challenges.

With current population estimates for all 27 countries, the optimistic scenario predicts an increase of 199.8 million people living in poverty by 2040, which equates to 6.5 percent of the total population in these countries. In contrast, the pessimistic scenario foresees a more dramatic increase, with 266.1 million people expected to fall into poverty, representing 8.7 percent of the total population.

These projections underscore the potential variability in poverty outcomes based on different future scenarios. The stark contrast between optimistic and pessimistic outcomes highlights the critical importance of effective policy responses and strategic planning to mitigate the adverse effects of megatrends and ensure sustainable development across the region.

Figure 4 Change in Poverty Headcount Ratios in Asia and the Pacific amid three megatrends



Source: Author's calculations based on the GTAP model and household income and expenditure surveys from 27 countries available in the ESCAP Social Protection Simulator.

How much social protection spending would be needed to counter the rise in poverty?

Given the projected increase in poverty across Asia and the Pacific, there will be a critical need for substantial increases in social protection expenditures by 2040. Figure 5 illustrates how much resources governments would have to directly transfer to affected individuals as a percentage of GDP in 2040 in an effort to lift individuals just above the poverty line under the combined effects of three major megatrends. This figure provides a comparative view of the financial demands under both optimistic and pessimistic scenarios.

It appears that if social protection expenditures do not increase drastically between 2024 and 2040, substantial additional resources will be needed to mitigate the combined negative effects of the three megatrends. On average, 6.2 per cent and 8.7 per cent of GDP will need to be mobilized and transferred to affected households if governments are to lift households out of poverty under the optimistic and pessimistic scenarios, respectively (Figure 5).[12]

In most cases, the cost associated with mitigating the pessimistic scenario is only marginally higher than the optimistic scenario, reflecting the greater need for social protection in response to more severe economic challenges and adverse conditions. For instance, under the pessimistic scenario, the Federated States of Micronesia would need a significant 38.4 percent of its GDP allocated to social protection transfers to effectively reduce poverty.[13] This substantial percentage highlights the extreme financial burden faced by countries experiencing the most severe impacts of the megatrends.

In contrast, under the same scenario, Bhutan would require a comparatively modest 0.8 percent of GDP for social protection transfers. This lower percentage reflects a relatively smaller financial burden in Bhutan, indicating that while social protection remains crucial, the scale of required intervention is less severe compared to more heavily impacted regions.

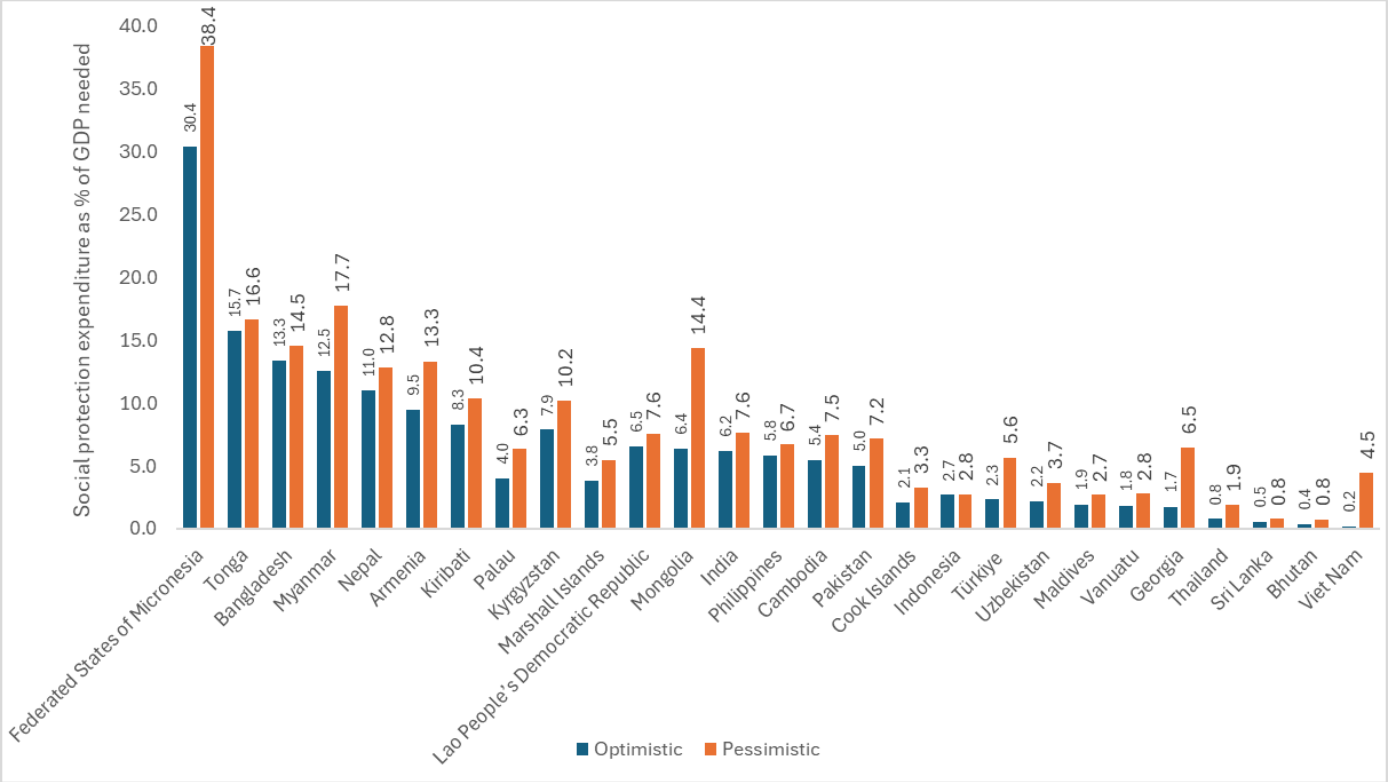
The stark differences between the optimistic and pessimistic scenarios underscore the importance of proactive and adaptive social protection policies. Countries facing higher financial requirements will need to mobilize significant resources to mitigate the adverse effects of megatrends on poverty. Meanwhile, those with lower financial needs can focus on optimizing their social protection strategies to ensure efficient and effective poverty alleviation.

Overall, Figure 5 highlights the urgent need for comprehensive social protection strategies tailored to the varying impacts of climate change, demographic transitions, and digitalization. It emphasizes the necessity for increased funding and targeted interventions to address the growing poverty challenges and support vulnerable populations across the region.

[12] These estimates assume perfect targeting of transfers to ll households under national poverty line. In reality, perfect targeting does not exist. Therefore, universal benefits would be needed to ensure that no affected household is left behind. Population size and openness (trade to GDP ratio) appear as control variables.

[13] The resources required is substantial in the Federated States of Micronesia, which is partly due to survey year being old from 2013.

Figure 5 Percentage of GDP needed in 2040 as social protection transfer to alleviate poverty under the combined effects of three megatrends



Source: Author's calculations based on the GTAP model and household income and expenditure surveys from 27 countries available in the ESCAP Social Protection Simulator.

VII: Conclusion

The Asia-Pacific region faces profound challenges from the megatrends of climate change, demographic shifts, and digital technologies. Without a significant increase in social protection expenditures, the region is expected to see a substantial rise in poverty by 2040. The disparity between optimistic and pessimistic scenarios underscores the severity of these potential impacts and highlights the urgent need for proactive measures.

To address these challenges effectively, governments must take immediate and decisive action. Enhancing social protection systems, investing in climate resilience, supporting healthy ageing, and embracing inclusive digitalization are critical steps to mitigate the adverse effects of these megatrends and build a more equitable and resilient future for all. The key message is: The price of inaction is that we will have higher poverty rates, which will require more spending in 2040. But if countries start increasing investing in social protection and fixing their social protection systems, then the cost of action is not going to be as high. The major areas for action include the following:

1. Climate Action: Governments need to implement and support robust climate policies aimed at limiting global warming to the lowest possible levels. Effective climate action will help reduce the economic and social impacts associated with higher temperatures and extreme weather events, thus lessening the overall burden on vulnerable populations.
2. Ageing Populations: As the population ages, developing strategies for healthy ageing and investing in healthcare infrastructure become essential. Providing adequate support for elderly citizens will alleviate the financial pressures associated with an ageing population and contribute to social stability. The ESCAP Social Outlook Report of 2024 has provided a number of policy recommendations for a healthy workforce and healthy ageing.[14]
3. Embracing Digitalization: Policymakers should focus on creating inclusive digital economies that offer opportunities for all, including those at risk of being left behind. Investments in digital literacy and skills training are crucial for mitigating the negative impacts of digital disruption and ensuring that no one is excluded from the benefits of technological advancements.
4. Strengthening Social Protection: Expanding social protection systems to cover more individuals and enhancing the adequacy of benefits are vital steps. This includes improving access to both contributory and non-contributory schemes and programmes to provide comprehensive support for all segments of the population. The ESCAP Social Outlook Report of 2024 has provided concrete actions which should be taken between 2024 and 2040.[15]

The projected rise in poverty and the associated financial costs underscore the urgency for governments to act now. By committing to these strategies and investing in the necessary frameworks, countries in the Asia-Pacific region can navigate these complex challenges and secure a brighter, more equitable future for their populations. The stakes are high, but with the right approach and collaborative effort, the region can overcome these obstacles and ensure long-term prosperity and resilience.

[14] United Nations Economic and Social Commission for Asia and the Pacific (2024). Protecting our future today: Social protection in Asia and the Pacific. Social Outlook for Asia and the Pacific. ESCAP, Bangkok.
[15] Ibid.

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