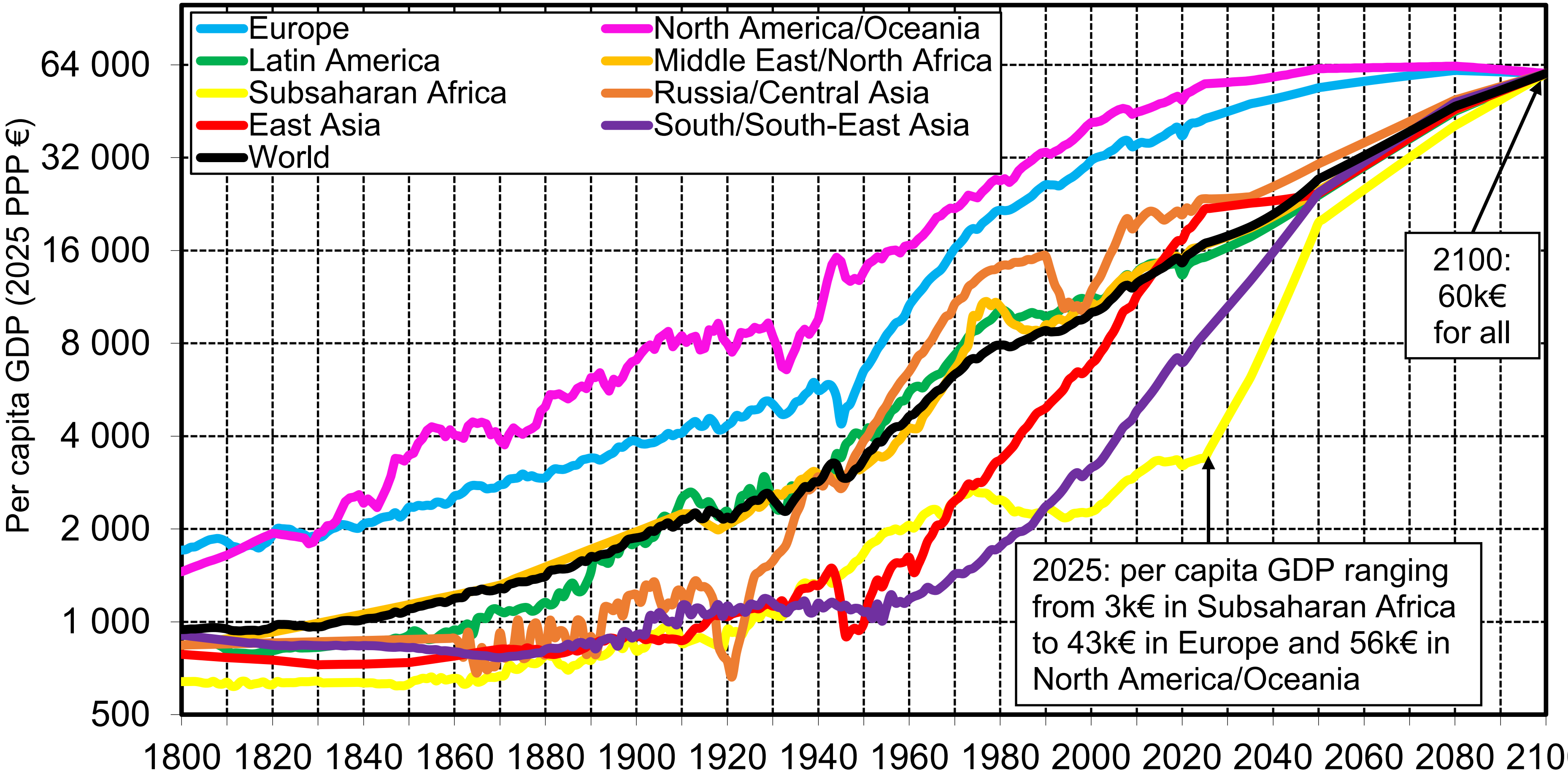
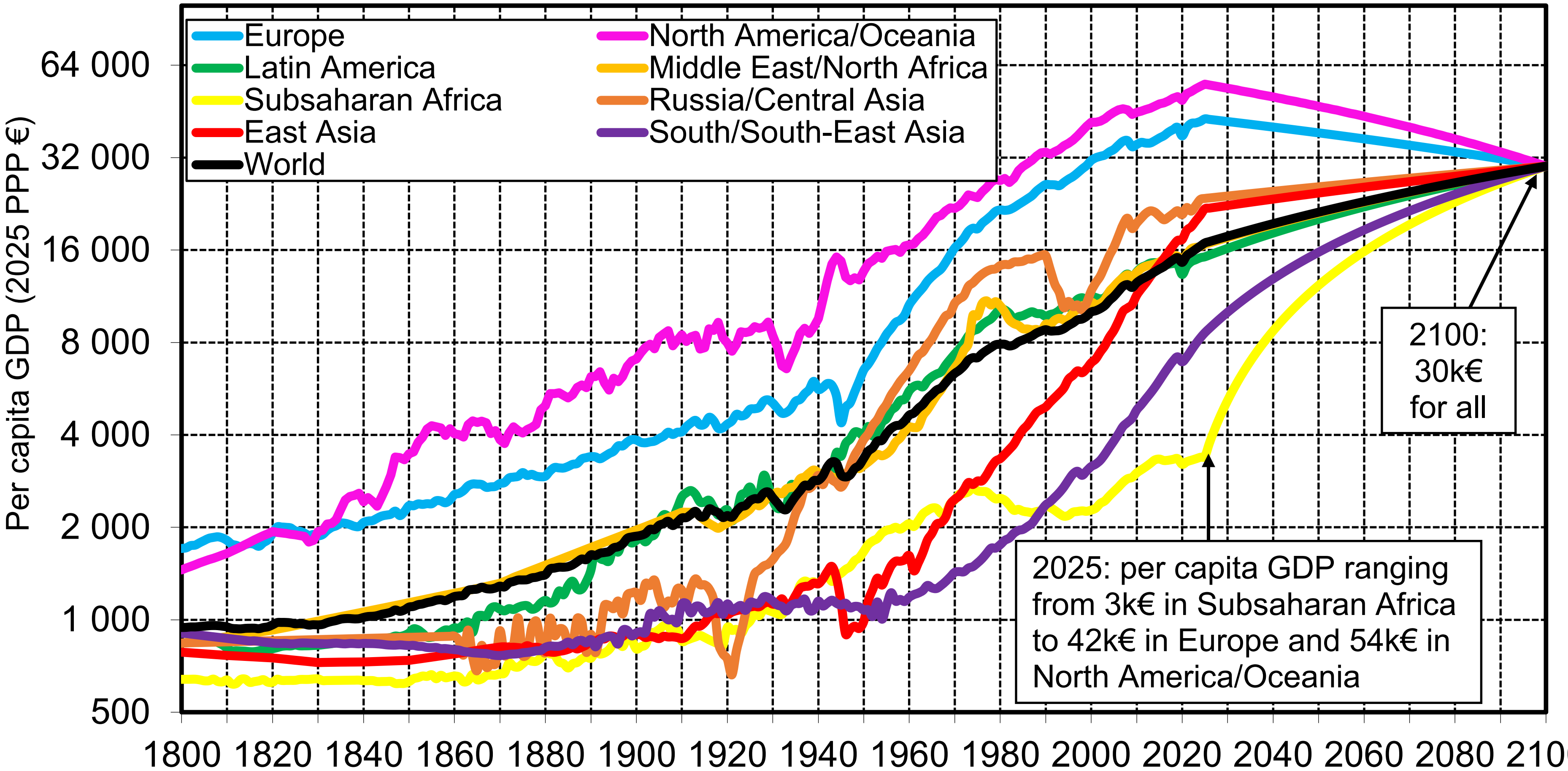
# Fig. 1a. Is Prosperity for All Compatible with Planetary Boundaries?



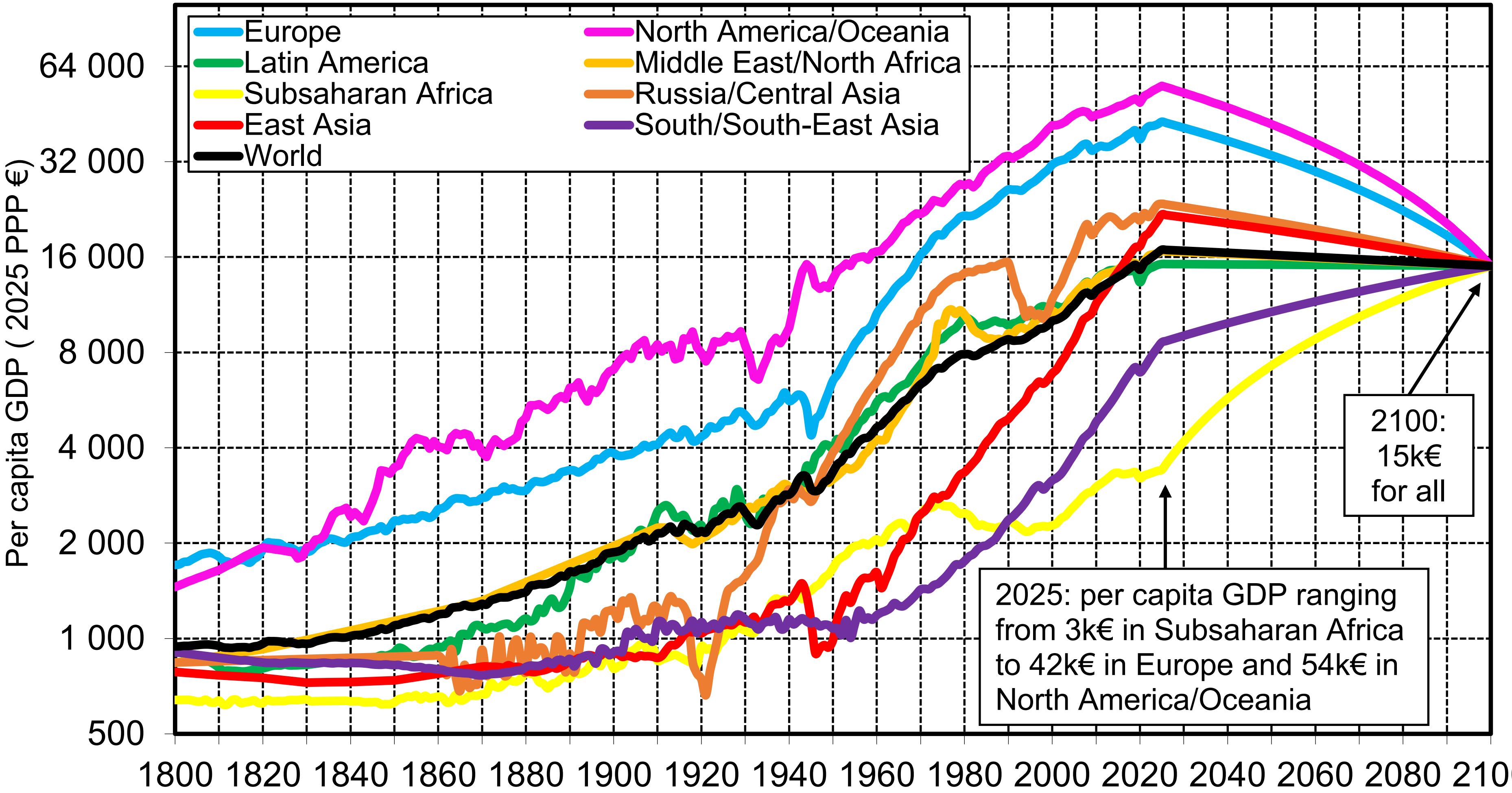

**Interpretation**. In this research, we ask whether high living standards for all (say, with per capita GDP around 60k€ PPP 2025 by 2100) are compatible with planetary boundaries. We find that the 60k target is possible only under very strict conditions: drastic reduction in labour hours, major shift from material to immaterial sectors, change in food habits and decarbonization of production. **Sources and series**: wseed.world (A1a)

# Fig. 1b. Or Do We Need A Little Degrowth for Rich Countries?




**Interpretation**. In this research, we ask whether high living standards for all (say, with per capita GDP around 60k€ PPP 2025 by 2100) are compatible with planetary boundaries. We find that the 60k target is possible only under very strict conditions: drastic reduction in labour hours, major shift from material to immaterial sectors, change in food habits and decarbonization of production. **Sources and series**: wseed.world (A1b)

## Fig. 1c. Or a Large Degrowth for Rich Countries?




**Interpretation**. In this research, we ask whether high living standards for all (say, with per capita GDP around 60k€ PPP 2025 by 2100) are compatible with planetary boundaries. We find that the 60k target is possible only under very strict conditions: drastic reduction in labour hours, major shift from material to immaterial sectors, change in food habits and decarbonization of production. **Sources and series**: wseed.world (A1c)

## Table 1. The Classification of Economic Sectors Used in the World Sectoral Economy-Environment Database (WSEED)

| | Sector | ISIC 3 Code | ISIC 4 Code | Included Sectors and Industries |
|---|---|---|---|---|
| Material Sectors | **Food** (incl. agriculture & processed food) | A+B+D15-16 | A+C10-12 | Agriculture; fishing; forestry; Manufacturing of food, beverages, tobacco |
| | **Housing/Construction** (incl. housing services and construction) | F + K (part) | F + L (part) | Housing services; Construction |
| | **Manufacturing** (incl. textiles, electronics, cars, etc.) | D exc. D15-16 | C exc. C10-12 | All manufacturing except food products: e.g. textiles, electrical equipment, machniery, vehicles, paper, chemicals, metals, plastics, etc. |
| | **Energy** (incl. mining) | C + E | B + D+E | Electricity, oil, gas; Water treatment and supply; Sewerage and waste managment; Mining and quarrying |
| | **Transport** (incl. train, bus, air, boat, etc.) | I | H | Land, water, air transport; pipelines; warehousing |
| Immaterial Sectors | **Education/Health** (incl. other public services) | L+M+N | O+P+Q | Education; Human health; Residential care and social work activities; Public Administration: public order, defense, foreign affairs |
| | **Leisure/Culture** (incl. shops, restaurants, bars, hotels, movies, books, etc.) | G+H+O+P | G+I+J+R+S+T | Wholesale & retail trade; Accomodation & food service activities ; Repair; Publishing, movie, broadcasting; Arts, museum, libraries; Sports & recreation |
| | **Other services** (incl. legal, financial, consulting, computing, architecture, etc.) | J+K | K+L+M+N | Financial, insurance, pension, IT, consultancy; Real estate (exc. Housing services); Legal, Accounting; Scientific R&D; Advertising, architectural, technical |

**Description**. This research relies on the construction of a novel eight-sector database to analyse structual transfromation and track sectoral emissions for the 57 WID core territories from 1970 to 2025. All sources are harmonized to eight equivalent sectors. These eight sectors (five "material" and three "immaterial") are partly based on ISIC classifications (International Standard Industrial Classification for all Economic Activities, United Nations), with a number of changes and adjustments. The distinction between material and immaterial sectors is based upon input intensity: material sectors have more input intensity and material footprint than immaterial sectors. This differs from traditional classifications and is arguably more suitable for the study of sustaiable development and well-being. The extent to which the immaterial sectors are truly immaterial – and/or can become even more so in the future – is a central issue which is closely investigated in this research. **Source:** wseed.world (A0a)

## Table 2. The Structure of Economic Sectors & Energy Subsectors Used in WSEED

| | Sector |
|---|---|
| Material Sectors | **Food** (incl. agriculture and processed food) |
| | **Housing/Construction** (incl. housing services and construction) |
| | **Manufacturing** (incl. textiles, electronics, cars, etc.) |
| | **Energy** (incl. mining) |
| | **Transport** (incl. train, bus, air, boat, etc.) |
| Immaterial Sectors | **Education/Health** (incl. other public services) |
| | **Leisure/Culture** (incl. shops, restaurants, bars, hotels, movies, books, etc.) |
| | **Other services** (incl. legal, financial, consulting, computing, architecture, etc.) |

| | Energy Subsector |
|---|---|
| **Energy (incl. mining)** | Coal |
| | Gas |
| | Oil / Liquid Fuels |
| | Electricity |
| | Minerals |
| | Water & Waste |

| | Electricity Subsector |
|---|---|
| **Electricity** | Coal Power |
| | Gas Power |
| | Oil Power |
| | Other Power |
| | Nuclear Power |
| | Hydro power |
| | Solar power |
| | Wind power |
| | Electricity transmission and distribution |

**Description**. For the projection framework and emission analysis, it is essential to model the energy sector in more detail. Thus, we employ additional data sources to break up the energy sector into subsectors. Thereby, we proceed on two levels breaking up energy and then the elctricity sector further. We always asure that the aggregate is the sum of the subsectors. In our energy/emission projections, we work with the most disaggregated input-output structure whereby we model the energy transition as a shift to the electricity sector as well as to low-carbon sources within the energy and the electricity sector. **Source**: wseed.world (X1)

## Table 3. Geographical Coverage of the WSEED Database

| | |
|---|---|
| **East Asia** (5) | China, Japan, South Korea, Taiwan<br>Other EASA |
| **Europe** (11) | Britain, Denmark, France, Germany, Italy, Netherlands,<br>Norway, Spain, Sweden, Other W.EUR, Other E.EUR |
| **Latin America** (6) | Argentina, Brasil, Chile, Colombia<br>Mexico, Other LATAM |
| **Middle East/<br>North Africa** (8) | Algeria, Egypt, Iran, Morocco, Saudi<br>Arabia, Turkey, UAE, Other MENA |
| **North America/<br>Oceania** (5) | USA, Canada, Australia, New Zealand<br>Other NAOC |
| **Russia/<br>Central Asia** (2) | Russia<br>Other RUCA |
| **South/South-East<br>Asia** (9) | Bangladesh, India, Indonesia, Myanmar, Pakistan,<br>Philipinnes, Thailand, Vietnam, Other SSEA |
| **Sub-Saharan<br>Africa** (11) | DR Congo, Ethiopia, Kenya, Ivory Coast, Mali, Niger,<br>Nigeria, Rwanda, Sudan, South Africa, Other SSAF |

**Description.** Our sectoral database covers all 57 WID core territories (48 main countries + 9 residual regions) over the 1970-2025 period. The 48 main countries were chosen on the basis of population size, GDP, regional representativity and data availability. Throughout the 1800-2025 period, the 48 main countries cover about 85-90% of the world population and GDP, while the 9 residual regions cover 10-15%. Some of the series (including population and sectoral GDP) are also available for all 216 WID core countries, but some of the key series (including input-ouput matrices and labour hours by sector) are only available for the 57 core territories in a consistent manner. See wid.world/codes-dictionary/#country-code for the full list of WID 216 core countries. **Source:** wseed.world (A0b)

| Table 4. Sources used for the World Sectoral Economy-Environment Database (WSEED) | | |
|---|---|---|
| **Variables** | **Description** | **Sources** |
| **Sectoral GDP & Sectoral Prices** | Total Economy GDP and Deflator from WID, sectoral shares newly harmonized for all 57 core territories | WID National Accounts Database |
| | | World Input-Ouput Database |
| | | Long-run WIOD |
| | | ETD (Economic Transformation Database) |
| | | ETD Transition Economies |
| | | African Sector Database |
| | | 10-Sector Database |
| | | OECD Inter-Country Input-Output Tables (2023 Release and new PYP tables) |
| | | UN Data: National Accounts Official Country Data (Tables 2.1 - 2.4) |
| | | UN Data: National Accounts Estimates of Main Aggregates |
| | | International Comparison Program (ICP) Public Data |
| **Sectoral Labour Hours** | Total Economy from Andreescu et al. (2025), sectoral shares newly harmonized for all 57 core territories | ILOSTAT: mean weekly hours |
| | | ETD (Economic Transformation Database) |
| | | ETD Transition Economies |
| | | African Sector Database |
| | | 10-Sector Database |
| | | ILO Modelled Estimates |
| **Expenditure, A-matrix & Trade** | Harmonization of total and sectoral expenditure (total, consumption, investment), imports, exports and technical coefficients | FIGARO |
| | | OECD Inter-Country Input-Output Tables (2023 Release and new PYP tables) |
| | | World Input-Output Database |
| | | Long-run WIOD |
| | | GTAP (Global Trade Analysis Project) |
| **GHG Emissions** | Sectoral production and final demand emissions for all 57 WID core territories | FIGARO |
| | | Global Carbon Project |
| | | GTAP (Global Trade Analysis Project) |
| **Land Use** | Land-use by regions and for the world | FAO |
| | | OWID |
| **Population** | Latest version of WID-UN Population Series for all 216 WID core countries | WID Population Series |
| | | UN World Population Prospects 2024 |

**Description**. This research relies on the construction of a novel eight-sector database to analyse structual transfromation and track sectoral emissions for the 57 WID core territories from 1970 to 2025. The table shows the key sources for used for each variable to create the harmonized series. All sources are harmonized to the equivalent sectors. All monetary variables are expressed in PPP Euros either in current prices or constant 2025 prices but can also be transformed in MER using real exchange rates. **Source:** wseed.world (A0c)

## Table 5. The Structure of Global Expenditure: Sectoral Per-Capita Gross National Expenditure, Final Consumption and Investment (2025)

| | | Total Economy | Material sectors | Food | Housing/ Construction | incl. Housing services | incl. Construction (housing & other) | Manufacturing | Energy | Transport | Immaterial sectors | Education Health | Leisure Culture | Other Services |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Per-Capita GNE (Gross National Expenditure) | (thousands PPP € 2025) | **16.9** | **8.9** | 1.8 | 3.5 | 1.2 | 2.3 | 2.5 | 0.5 | 0.6 | **8.0** | 3.7 | 2.9 | 1.4 |
| | (% total) | **100%** | **53%** | 10% | 20% | 7% | 13% | 15% | 3% | 3% | **47%** | 22% | 17% | 8% |
| Per-Capita Final Consumption Expenditure | (thousands PPP € 2025) | **12.3** | **5.2** | 1.7 | 1.2 | 1.1 | 0.0 | 1.3 | 0.5 | 0.5 | **7.1** | 3.6 | 2.5 | 1.0 |
| | (% total) | **100%** | **42%** | 14% | 10% | 9% | 0% | 10% | 4% | 4% | **58%** | 30% | 20% | 8% |
| Per-Capita Investment Expenditure | (thousands PPP € 2025) | **4.6** | **3.7** | 0.1 | 2.3 | 0.1 | 2.2 | 1.2 | 0.1 | 0.1 | **0.9** | 0.1 | 0.4 | 0.4 |
| | (% average) | **100%** | **80%** | 1% | 50% | 1% | 48% | 27% | 1% | 1% | **20%** | 2% | 9% | 9% |

**Interpretation**. Per capita GNE (Gross National Expenditure) amounts to about 16.9k Euros PPP at the world level in 2025 (i.e. 1.4k Euros per month). In 2025, 73 percent of GNE is consumption and 27 percent is investment. **Source:** wseed.world (G1)

## Table 6. The Structure of Global GDP: Sectoral Value-Added & Productivity (2025)

| | | **Total Economy** | **Material sectors** | Food | Housing/ Construction | incl. Housing services | incl. Construction (housing & other) | Manufacturing Goods | Energy | Transport | **Immaterial sectors** | Education Health | Leisure Culture | Other Services |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Per capita GDP** | (thousands PPP € 2025) | **16.9** | **8.1** | 1.4 | 2.4 | 1.3 | 1.1 | 2.5 | 1.1 | 0.7 | **8.8** | 2.7 | 3.2 | 3.0 |
| | (% total) | **100%** | **48%** | 8% | 14% | 8% | 6% | 15% | 7% | 4% | **52%** | 16% | 19% | 18% |
| **Per capita economic labour hours** | (hours) | **850** | **480** | 239 | 88 | 3 | 85 | 87 | 20 | 47 | **370** | 88 | 227 | 55 |
| | (% total) | **100%** | **56%** | 28% | 10% | 0.4% | 10% | 10% | 2% | 5% | **44%** | 10% | 27% | 6% |
| **Productivity (hourly GDP)** | (PPP € 2025) | **20** | **17** | 6 | 27 | 426 | 13 | 28 | 56 | 16 | **24** | 30 | 14 | 54 |
| | (% average) | **100%** | **85%** | 30% | 135% | 2146% | 63% | 143% | 284% | 79% | **120%** | 152% | 70% | 273% |

**Interpretation**. Per capita GDP amounts to about 16.9k Euros PPP at the world level in 2025 (i.e. 1.4k Euros per month). Per capita economic labour hours (i.e. excluding domestic labour) amount to about 840 hours per year, so that average productivity – as measured by hourly GDP – is approximately 20 Euros. Hourly productivity varies enormously across sectors, reflecting differences in technology, labour composition and capital intensity, as well as as institutional factors and disparities in bargaining power between sectors and countries. **Source:** wseed.world (F1a)

# Table 7. The Global Input-Ouput Matrix in 2025

| Each column reports intermediate consumption inputs used by each sector as % of its total output | **Total Economy** | Food | Housing Services | Construction | Manufacturing Goods | Energy | Education/ Health | Leisure/ Culture | Transport | Other Services |
|---|---|---|---|---|---|---|---|---|---|---|
| Food | **5%** | 35% | 0% | 1% | 3% | 1% | 2% | 5% | 1% | 0% |
| Housing Services | **2%** | 0% | 3% | 1% | 0% | 0% | 2% | 4% | 1% | 2% |
| Construction | **2%** | 0% | 6% | 8% | 0% | 1% | 2% | 1% | 1% | 1% |
| Manufacturing Goods | **16%** | 6% | 2% | 29% | 41% | 6% | 7% | 6% | 8% | 5% |
| Energy | **8%** | 3% | 2% | 5% | 9% | 38% | 3% | 3% | 15% | 2% |
| Education/Health | **1%** | 0% | 1% | 0% | 0% | 0% | 4% | 1% | 1% | 1% |
| Leisure/Culture | **7%** | 8% | 2% | 7% | 9% | 4% | 7% | 10% | 9% | 6% |
| Transport | **3%** | 2% | 0% | 3% | 3% | 3% | 2% | 4% | 13% | 1% |
| Other Services | **9%** | 3% | 10% | 7% | 4% | 4% | 8% | 10% | 9% | 23% |
| **Total Intermediate Inputs** | **52%** | **57%** | **26%** | **61%** | **69%** | **57%** | **36%** | **44%** | **58%** | **42%** |
| Sector Share in Ouput | 100% | 10% | 5% | 8% | 22% | 8% | 12% | 16% | 4% | 15% |
| Sector Share in GDP (value-added) | 100% | 8% | 8% | 6% | 15% | 7% | 16% | 19% | 4% | 18% |
| Sector Share in Intermediate Energy Use | 100% | 4% | 1% | 5% | 25% | 41% | 5% | 7% | 8% | 3% |

**Interpretation**. In order to produce 100€ of education/health. one spends 36€ in intermediate inputs (including 7€ in manufacturing goods and 3€ in energy). In order to produce 100€ in manufacturing goods, one spends 69€ in intermediate inputs (including 41€ in manufacturing goods and 9€ in energy). The material footprint of "immaterial" sectors is smaller than that of "material" sectors, but it should still be reduced substantially in order to become truly "immaterial". **Source:** wseed.world (O1a)

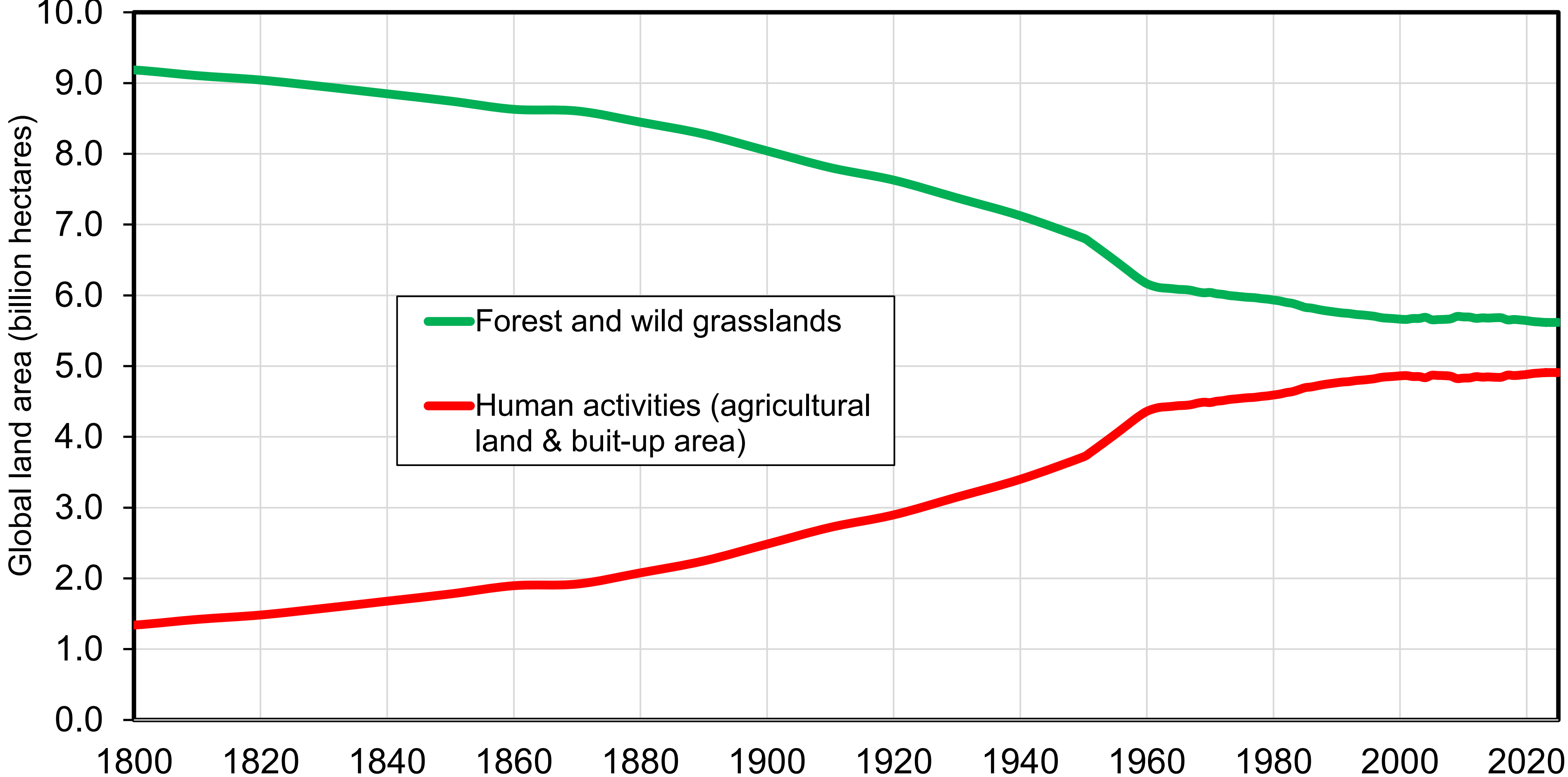
## Table 8. Global land area (2025)

| | Area (billion hectares) | % total |
|---|---|---|
| **Total land area** | **14.8** | ***100%*** |
| ***incl. Human activities*** | ***4.9*** | ***33%*** |
| *incl. Built up area* | *0.1* | *1%* |
| *incl. Grazing land (cattle)* | *3.2* | *22%* |
| *incl. Cropland* | *1.6* | *11%* |
| ***incl. Forest & wild grasslands*** | ***5.6*** | ***38%*** |
| *incl. Forests* | *4.1* | *28%* |
| *incl. Wild grasslands & shrubs* | *1.5* | *10%* |
| ***incl. Other Barren Land*** *(mountains, deserts..)* | ***4.3*** | ***29%*** |

**Interpretation.** Global land area amounts to about 14.8 billions hectares in 2025, including approximately 33% used by human activities (mostly grazing land and cropland), 38% in forests and wild grasslands and 29% in other barren land (mountains, deserts, etc.).

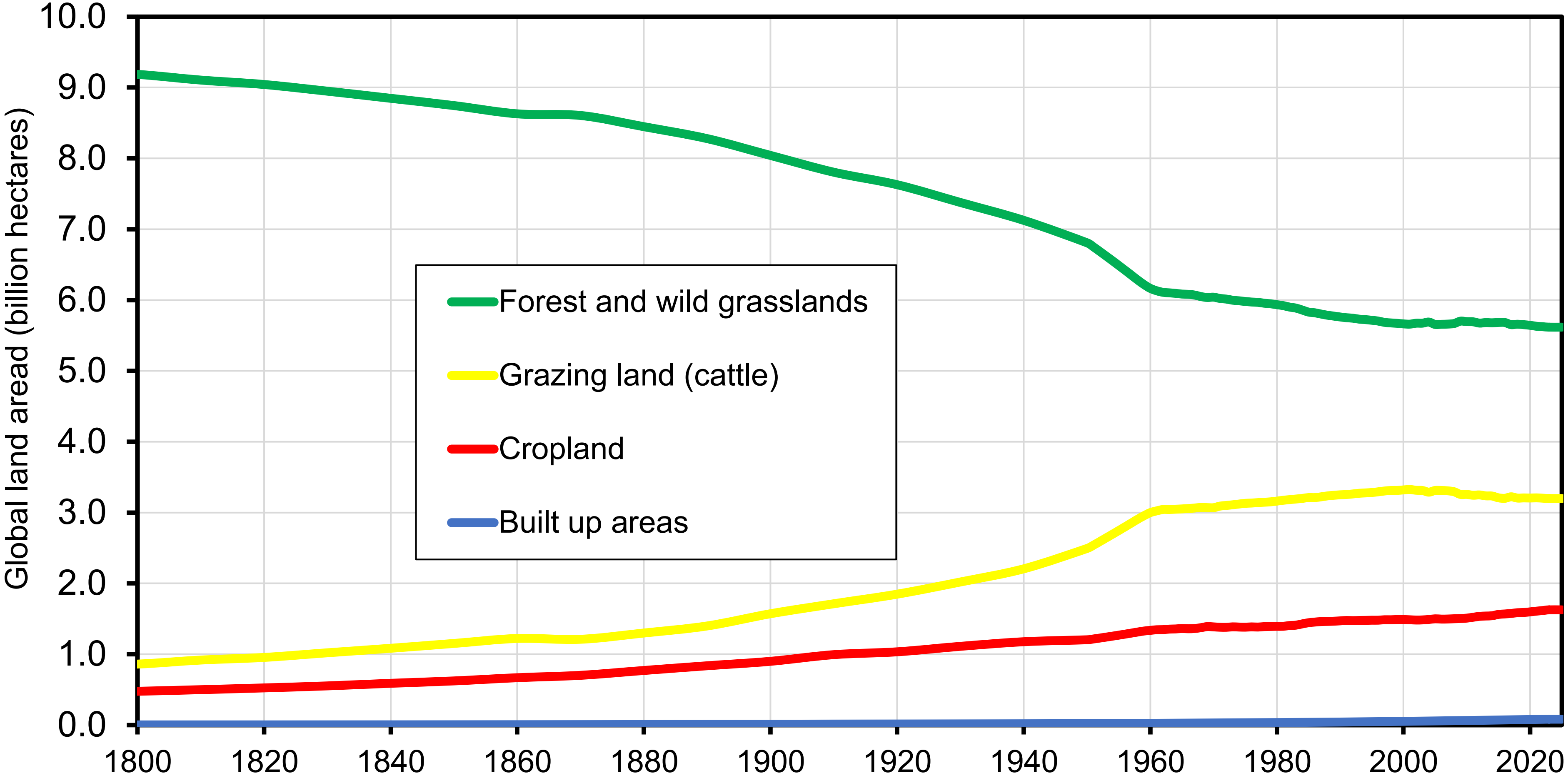
**Sources and series**: wseed.world (U1a)

## Fig. 2a. Global Land Use, 1800-2025: the Decline of Forest & Wild Grasslands, the Rise of Human Activities



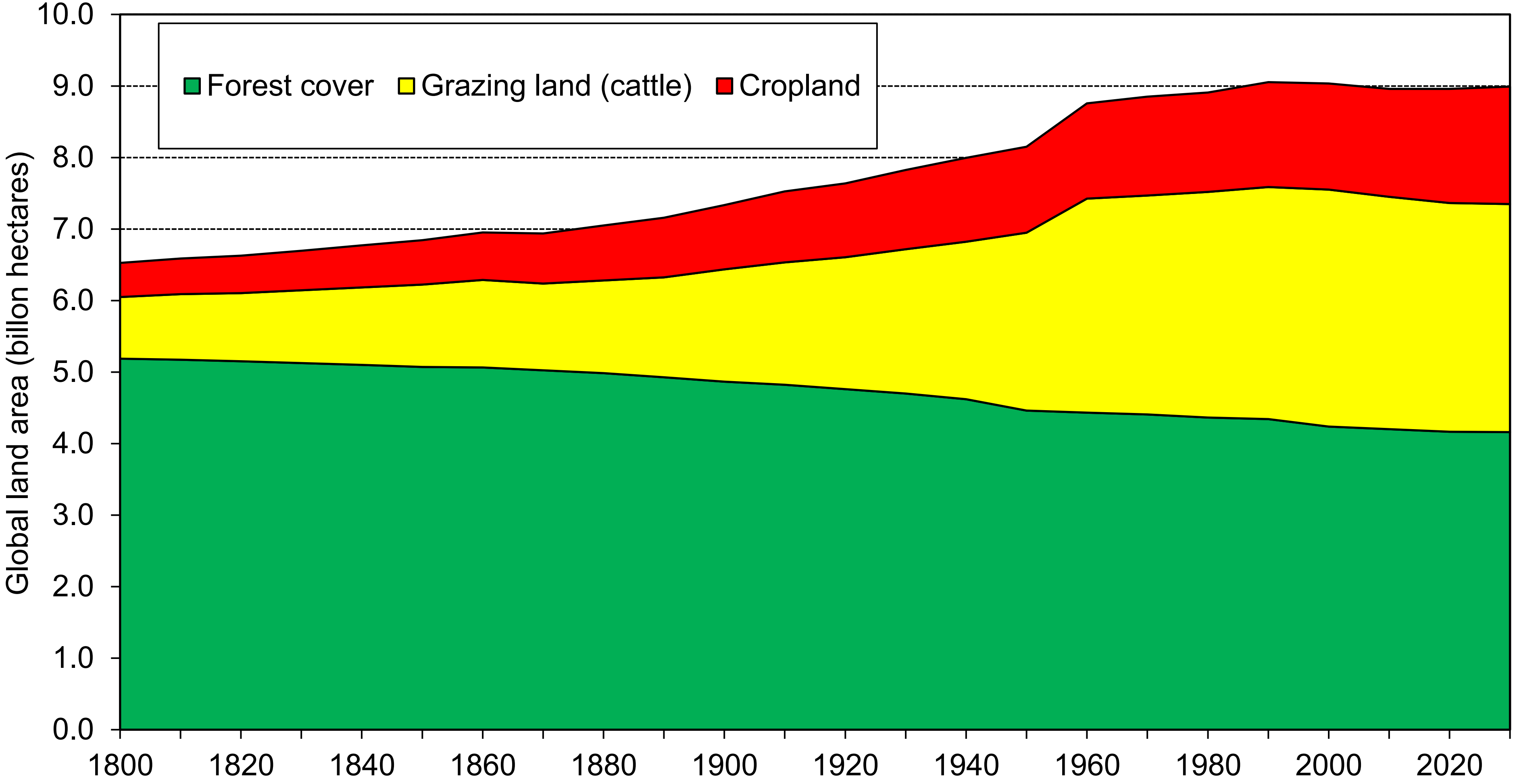

**Interpretation.** Global land area covered by forest & wild grasslands declined from about 9.2 billion hectares in 1800 (incl. 5.2 for forest and 4.0 for wild grasslands) to 8.0 billion in 1900 (incl. 4.8 and 3.2) and 5.6 billion in 2025 (incl. 4.1 and 1.5). Land area covered by human activities rose from 1.3 billion in 1800 to 2.5 billion in 1900 and 4.9 billion in 2025 (including 4.8 for agricultural land and 0.1 for built-up area). **Note.** Total land area also includes about 4.3 billion in other barren land (mountains, deserts, etc.), which has been approximately constant over time. **Sources and series**: wseed.world (U1a)

# Fig. 2b. The Great Transformation of Global Land Use 1800-2025: The Key Role of Grazing Land (Cattle)




**Interpretation.** Global land area covered by forest and wild grasslands declined from about 9.2 billions hectares in 1800 to 8.0 billions in 1900 and 5.6 billions in 2025. In the meantime land area covered by human activities rose from 1.3 billions in 1800 to 2.5 billions in 1900 and 4.9 billions in 2025 (including 3.2 for grazing land, 1.6 for cropland and 0.1 for built-up area). **Note.** Total land area also includes about 4.3 billions in other barren land (mountains, deserts, etc.), which has been approximately constant over time. **Sources and series**: wseed.world (U1b)

## Fig. 2c. The Replacement of Global Forest Cover by Agricultural Land (Grazing Land and Cropland), 1800-2025



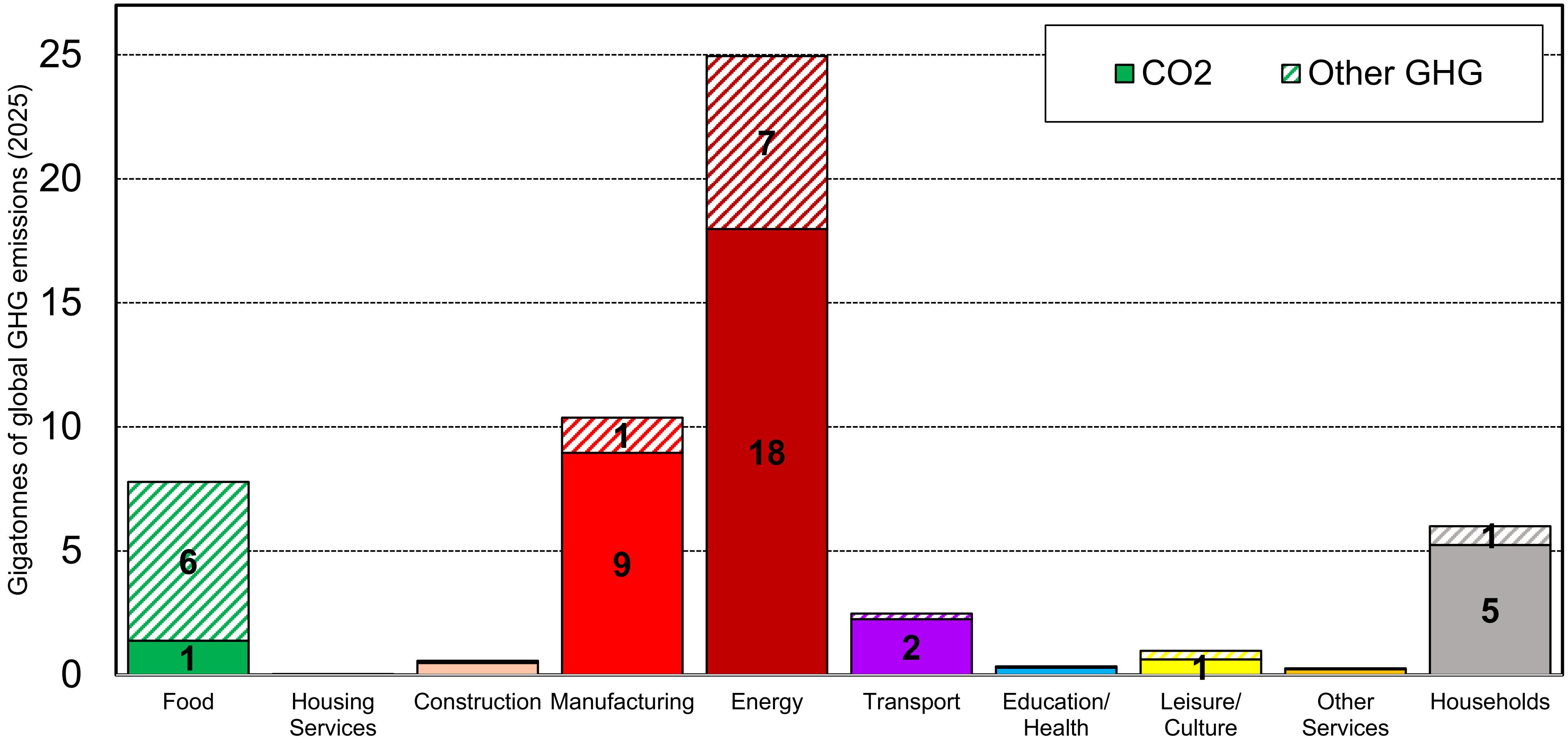

**Interpretation.** Global forest cover dropped from about 5.2 billions hectares in 1800 to 4.1 billions in 2025. In the meantime, agricultural land rose from 1.3 billions in 1800 (including 0.8 in grazing land and 0.5 in cropland) to 4.8 billions in 2025 (including 3.2 in grazing land and 1.6 in cropland). The expension of agricultural land was made possible both by the decline of forest cover (deforestation) and the fall of wild grasslands. **Sources and series**: wseed.world (U1c)

## Table 9. Global GHG Emissions in 2025

| | Emissions (GtCO2e) | Emissions (% Total) |
|---|---|---|
| **All sectors** | **56.7** | **100%** |
| **Fossil Fuels Energy** | ***39.8*** | ***70%*** |
| *incl. Fossil CO2 (coal/oil/gas burning)* | *36.2* | *64%* |
| *incl. Fossil other GHG (coal/gas production)* | *3.6* | *6%* |
| **Agriculture & Land Use Changes** | ***9.9*** | ***18%*** |
| *incl. Agr. Land Use CO2 (deforestation)* | *3.6* | *6%* |
| *incl. Agr. Land Use other GHG (cattle)* | *6.3* | *11%* |
| **Industrial Processes** | ***6.9*** | ***12%*** |
| *incl. Industry CO2 (cement, etc.)* | *2.7* | *5%* |
| *incl. Industry other GHG (chemicals, waste)* | *4.2* | *7%* |

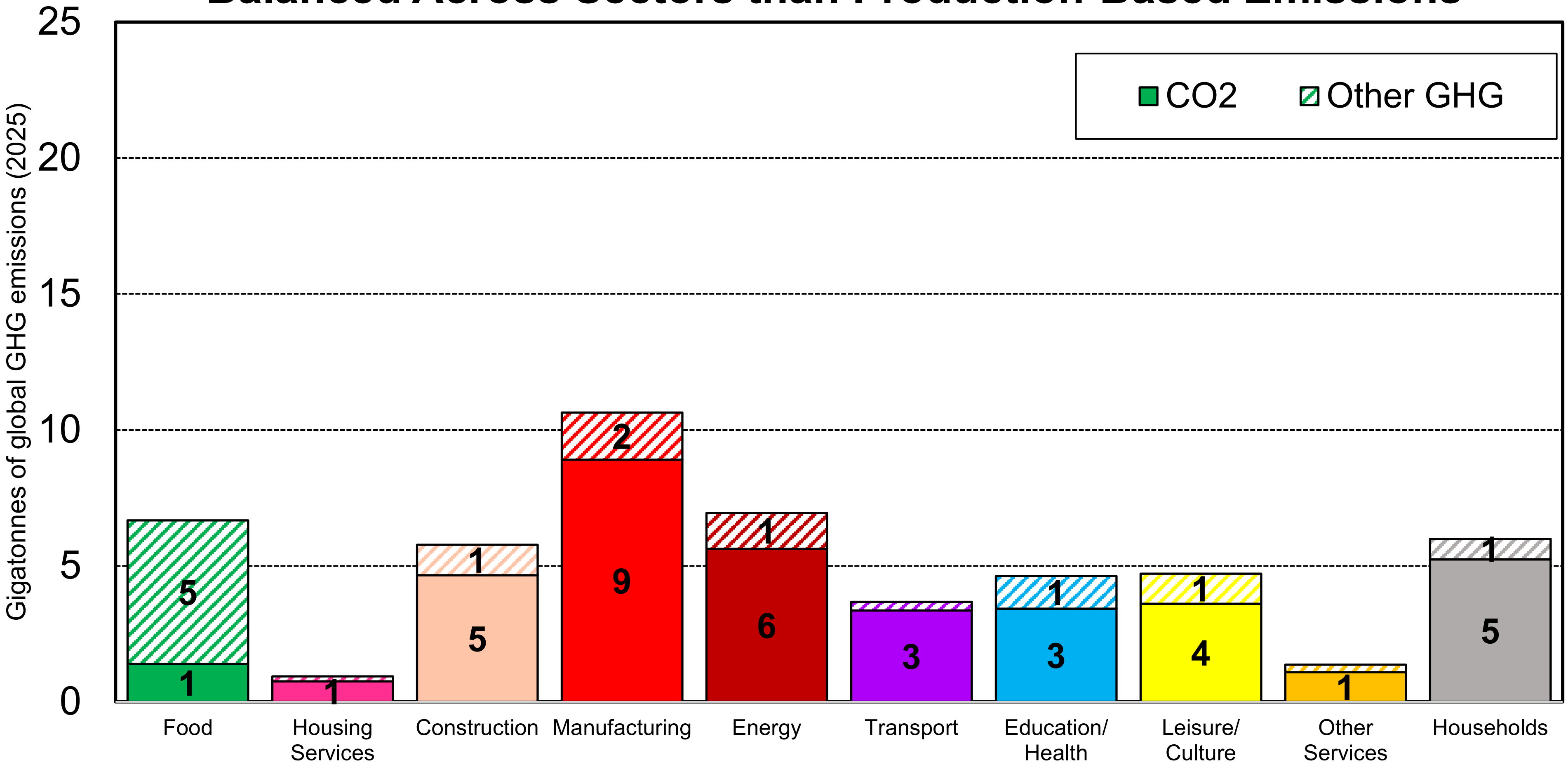
**Interpretation.** In 2025, 70% of GHG (greenhouse gases) emissions come from fossil fuels energy, 18% from agriculture & land-use changes and 12% from industrial processes. **Note.** For details on categories see online replication package. All greenhouse gases (CO2 and other GHG: methane (CH4), nitrous oxide (N2O), etc.) are expressed in gigatonnes of CO2 equivalents. **Sources**: wseed.world (X2)

**Fig. 3a. Production-Based Global GHG Emissions Are Massively Concentrated in Material Sectors**



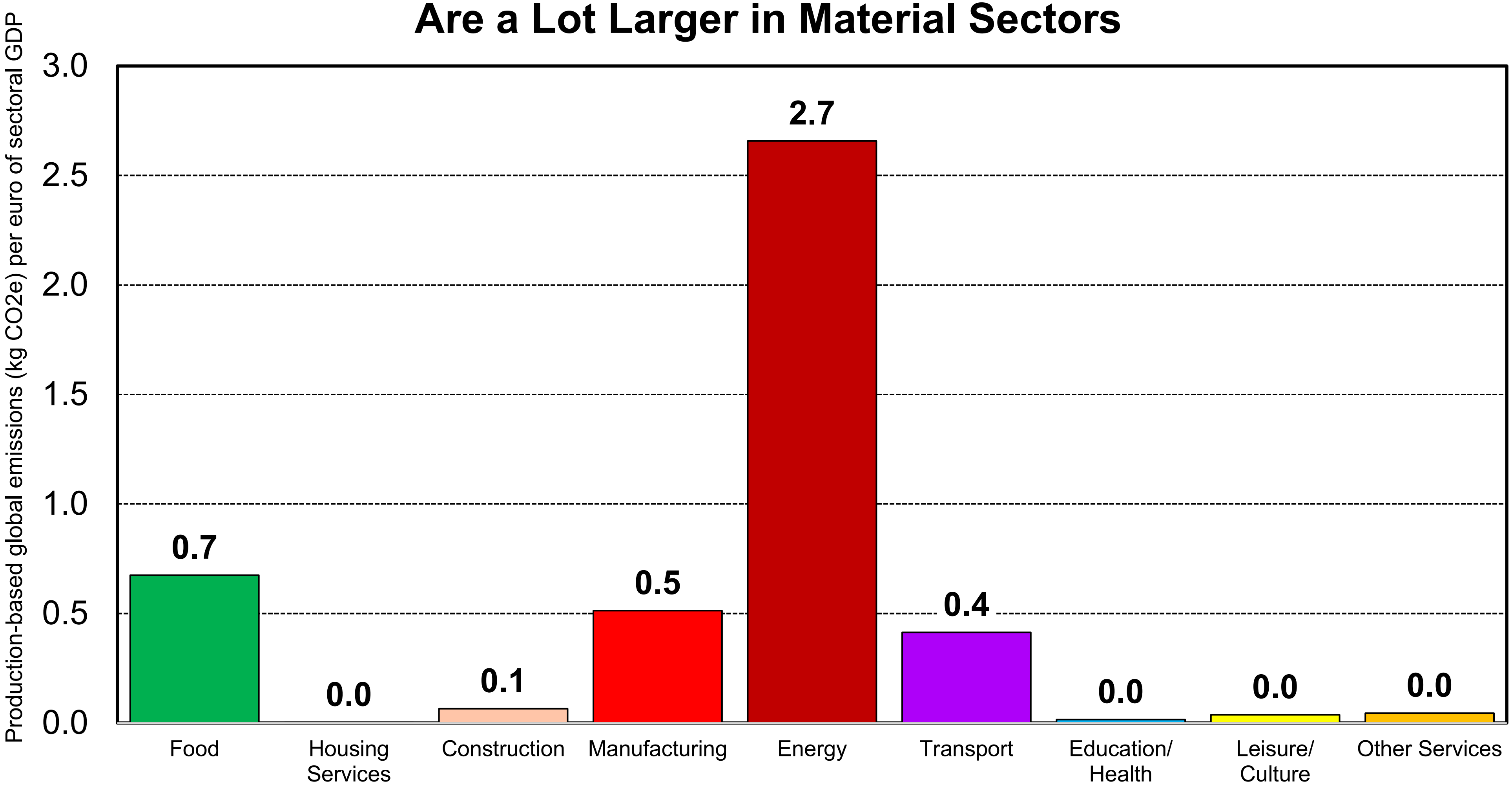

**Interpretation**. Out of the 57Gt of global GHG emissions in 2025, about 25 originate from the energy sector, 10 from manufacturing sector, 7 from the food sector and 6 from the household sector (direct energy use by households). This production-based perspective is partly artificial, however, as it ignores the intermediate inputs used by the various sectors. **Note**: Emissions of the household sector correspond to direct energy consumption by households, primarily for residential heating and personal vehicle use, and are counted separately. **Sources and series**: wseed.world (S1)

## Fig. 3b. Expenditure-Based GHG Emissions Are More Balanced Across Sectors than Production-Based Emissions



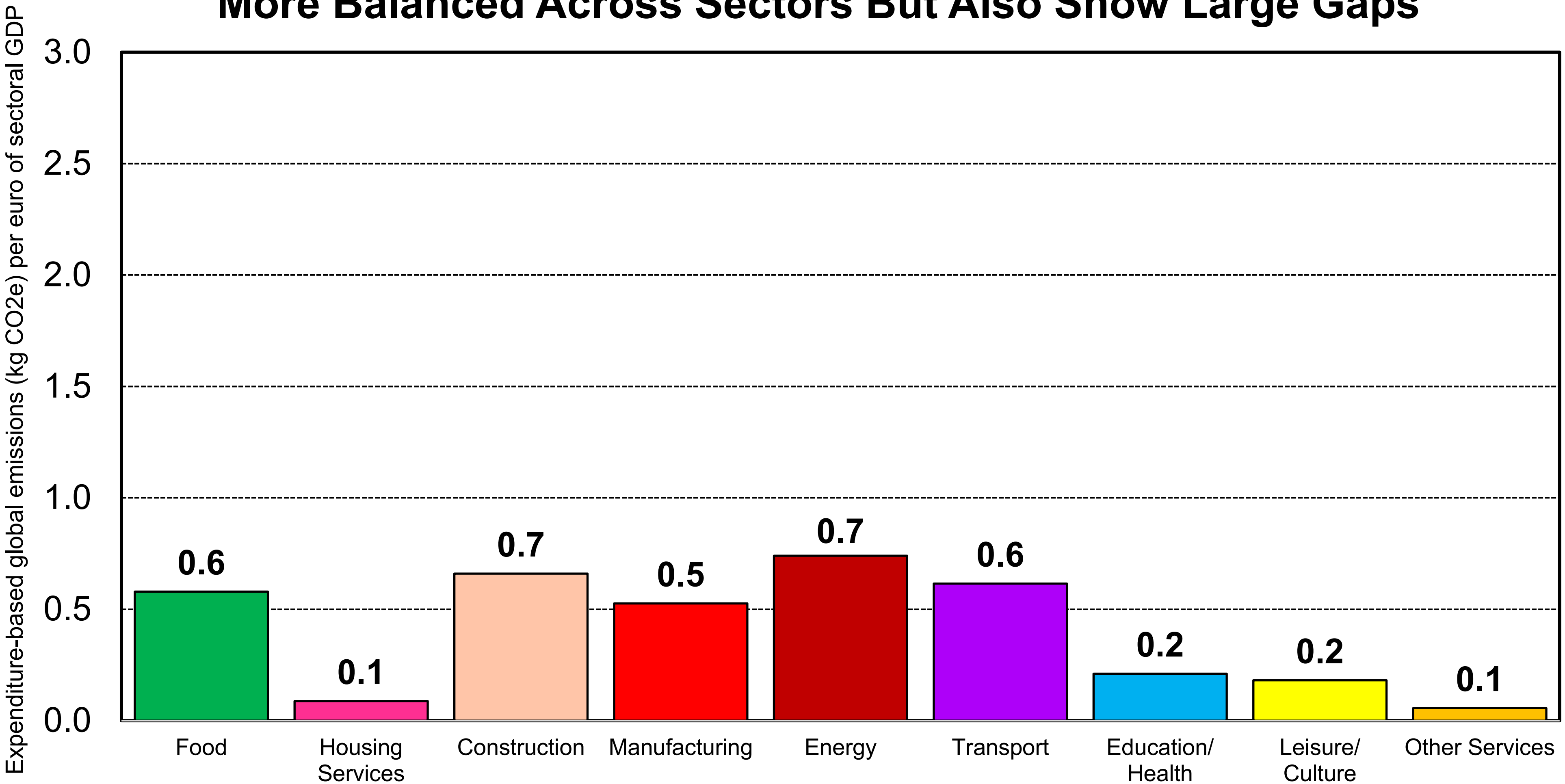

**Interpretation**. Once we take into account the global GHG emissions associated to the intermediate inputs used by the various sectors (expenditure-based emissions), then the distribution of emissions across sectors appears to be more balanced than under the perspective of production-based emissions. **Note**. Emissions of the household sector correspond to the direct energy consumption of households, primarily for residential heating and personal vehicle use, and are counted separately. **Sources and series**: wseed.world (S2)

# Fig. 3c. Production-Based GHG Emission Intensities Are a Lot Larger in Material Sectors



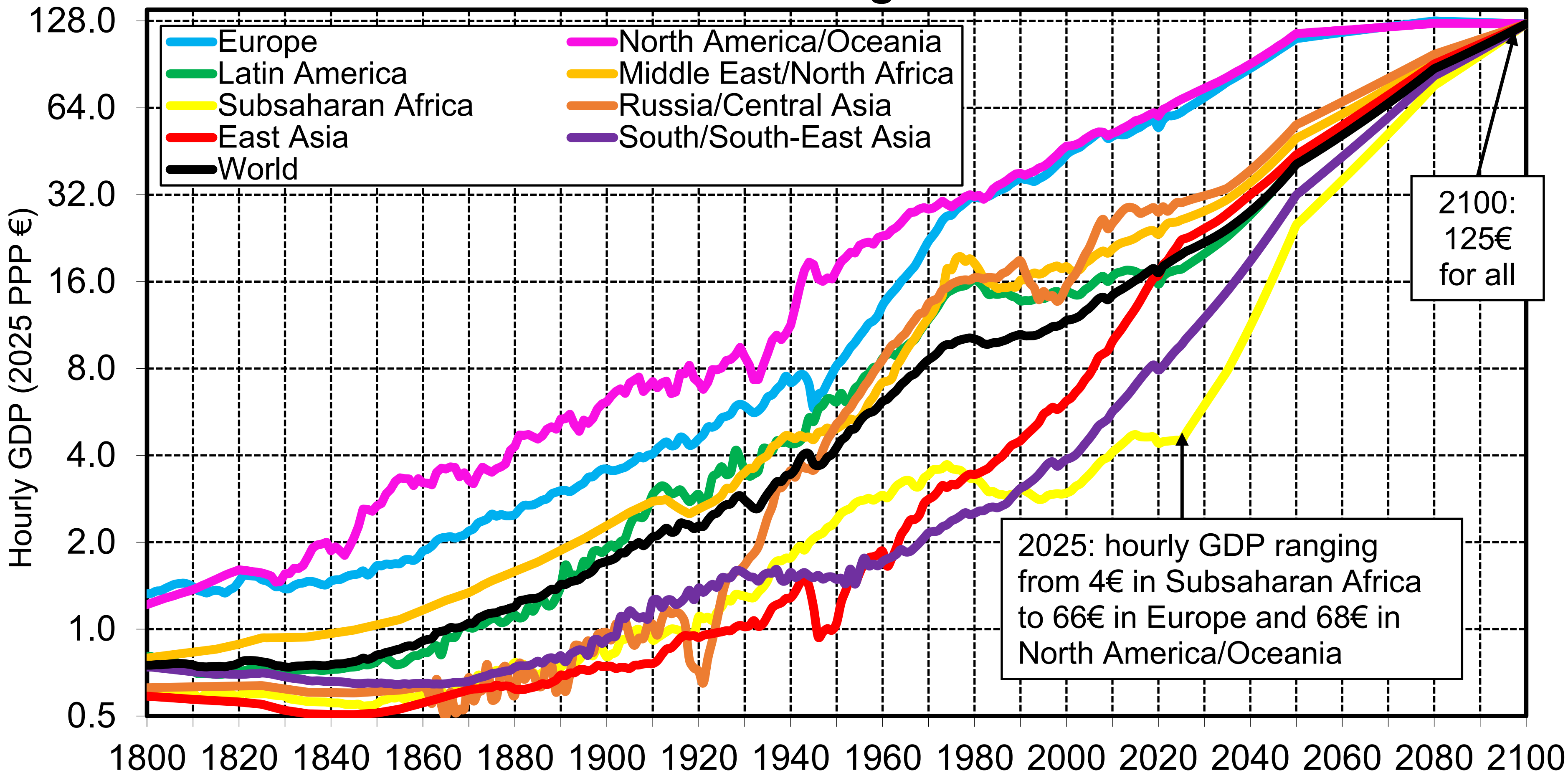

**Interpretation**. According to the production-based approach, global GHG emission intensities are a lot larger in material sectors and close to zero in immaterial sectors. This production-based perspective is partly artificial, however, as it ignores the intermediate inputs used by the various sectors. **Sources and series**: wseed.world (S3)

# Fig. 3d. Expenditure-Based GHG Emission Intensities Are More Balanced Across Sectors But Also Show Large Gaps



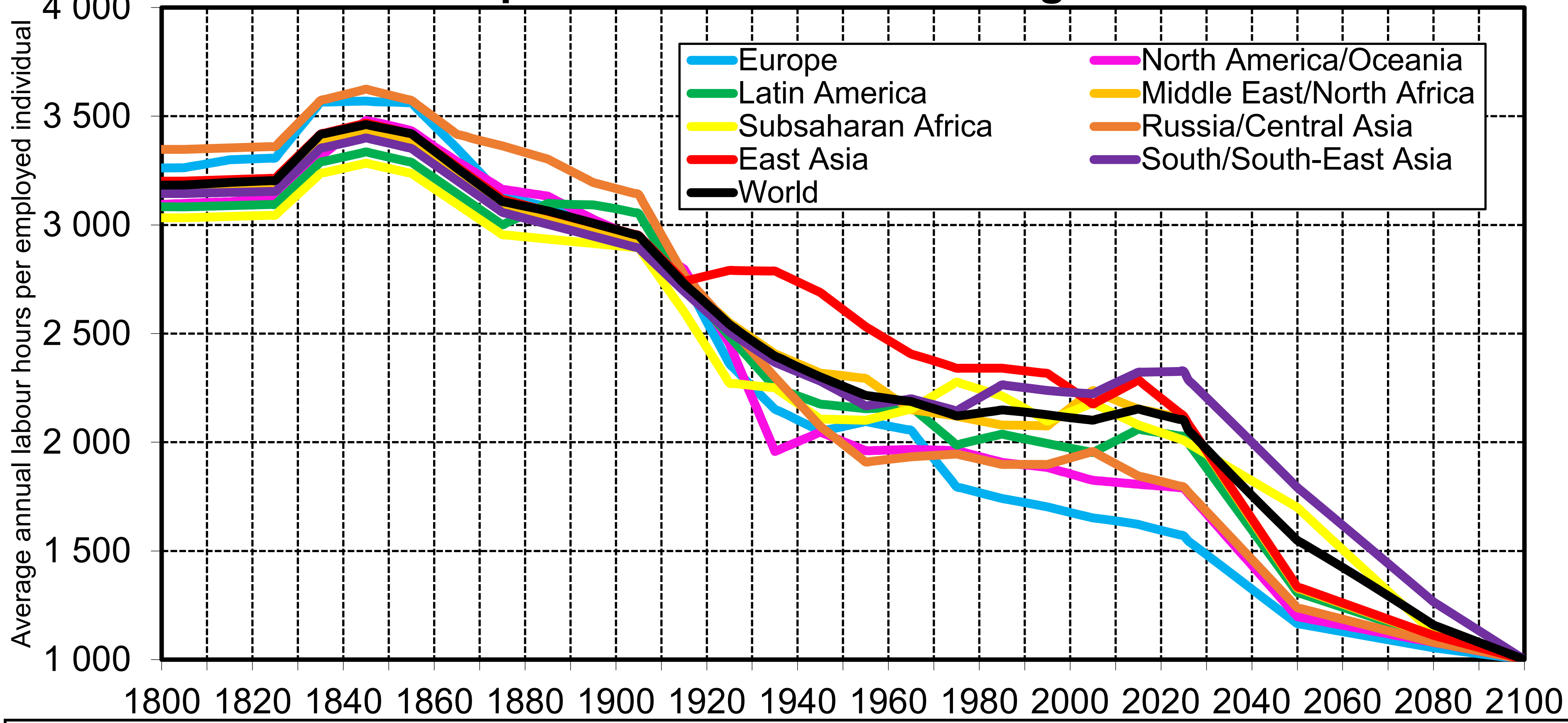

**Interpretation**. Because they take into account intermediate inputs, expenditure-based global GHG emissions intensities are more balanced across sectors than production-based intensities. But they also show large gaps: immaterial sectors have GHG intensities that are around three to four times smaller (per euro of sectoral GDP) than material sectors, which is already very substantial. **Sources and series**: wseed.world (S4)

## Fig. 4. World Productivity Trends 2025-2100: Sustainable Convergence Scenario



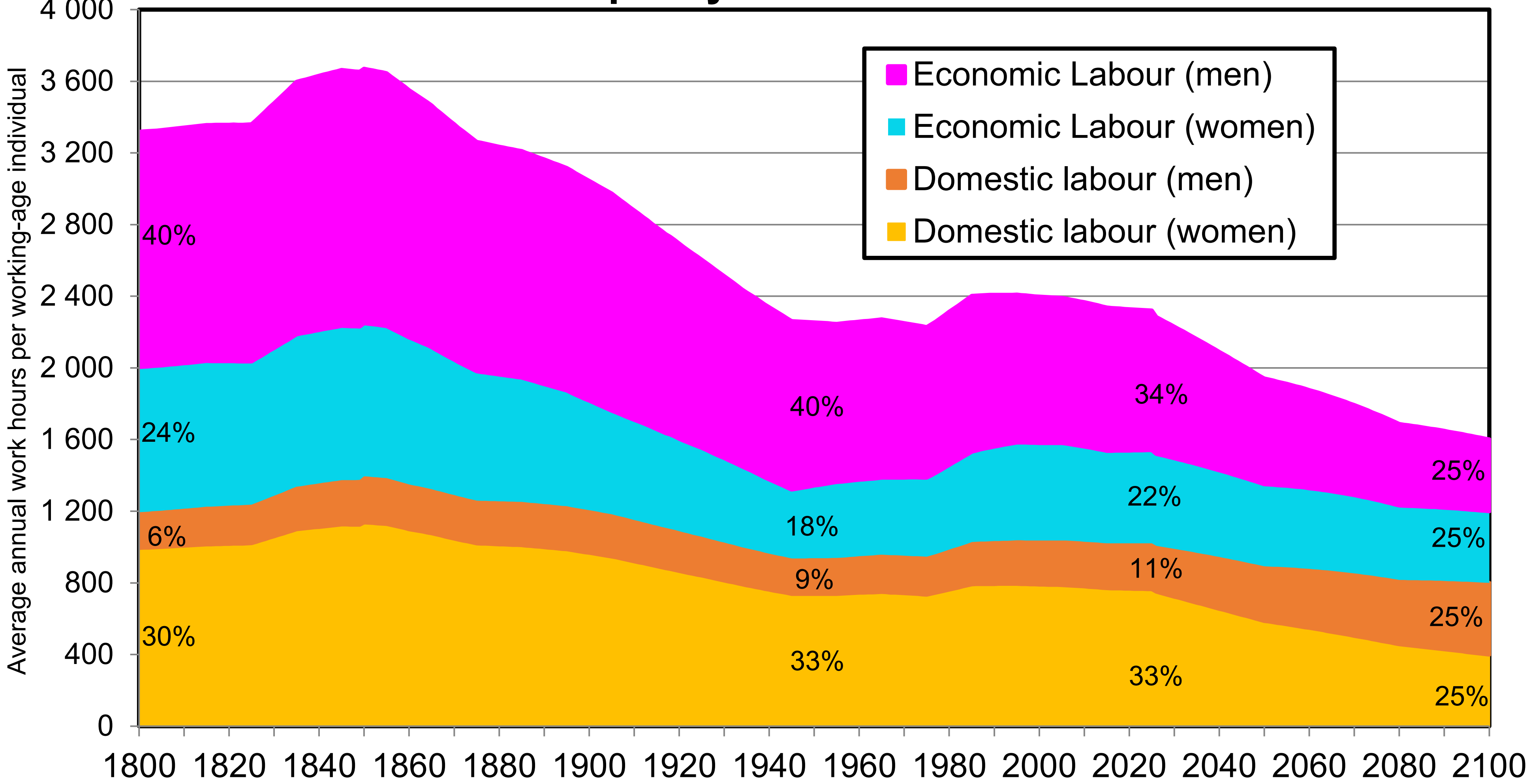

**Interpretation**. Under the Sustainable Convergence scenario, all countries converge toward high productivity by 2100, namely 125€ in hourly GDP (gross domestic product per economic labour hour). **Sources and series**: see wseed.world (F1a)

## Fig. 5. Using Productivity Gains to Reduce Work Hours & Material Footprint: Sustainable Convergence 2025-2100




**Interpretation**. Under the Sustainable Convergence scenario, average annual labour hours decline from about 2100 to 1000 hours globally between 2025 and 2100. Note. Annual labour hours around 3000-3500 hours correspond to about 60-65 hours per week all year long. Annual hours around 2000 hours correspond to 40 hours per week during 50 weeks (2 weeks in paid vacation); annual hours around 1600 hours correspond to 35 hours per week during 47 weeks (5 weeks in paid vacation); annual hours around 1000 hours correspond to 25 hours per week during 40 weeks (12 weeks in paid vacation). **Sources and series**: wseed.world (E1a)

# Fig. 6. The Structural Transformation of Work 1800-2100: Toward Gender Equality in Domestic & Economic Labour




**Interpretation.** In the Sustainable Convergence scenario, working-age men and women are projected to supply the same quantity of economic labour and domestic labour and to receive equal average pay. This would represent a continuation of the trend toward gender equality observed between 1950 and 2025, albeit with a major acceleration. **Sources and series**: wseed.world (E1b)

**Table 10. Using Productivity Gains to Reduce Labour Hours: Lessons from the Past and Scenarios for the Future**

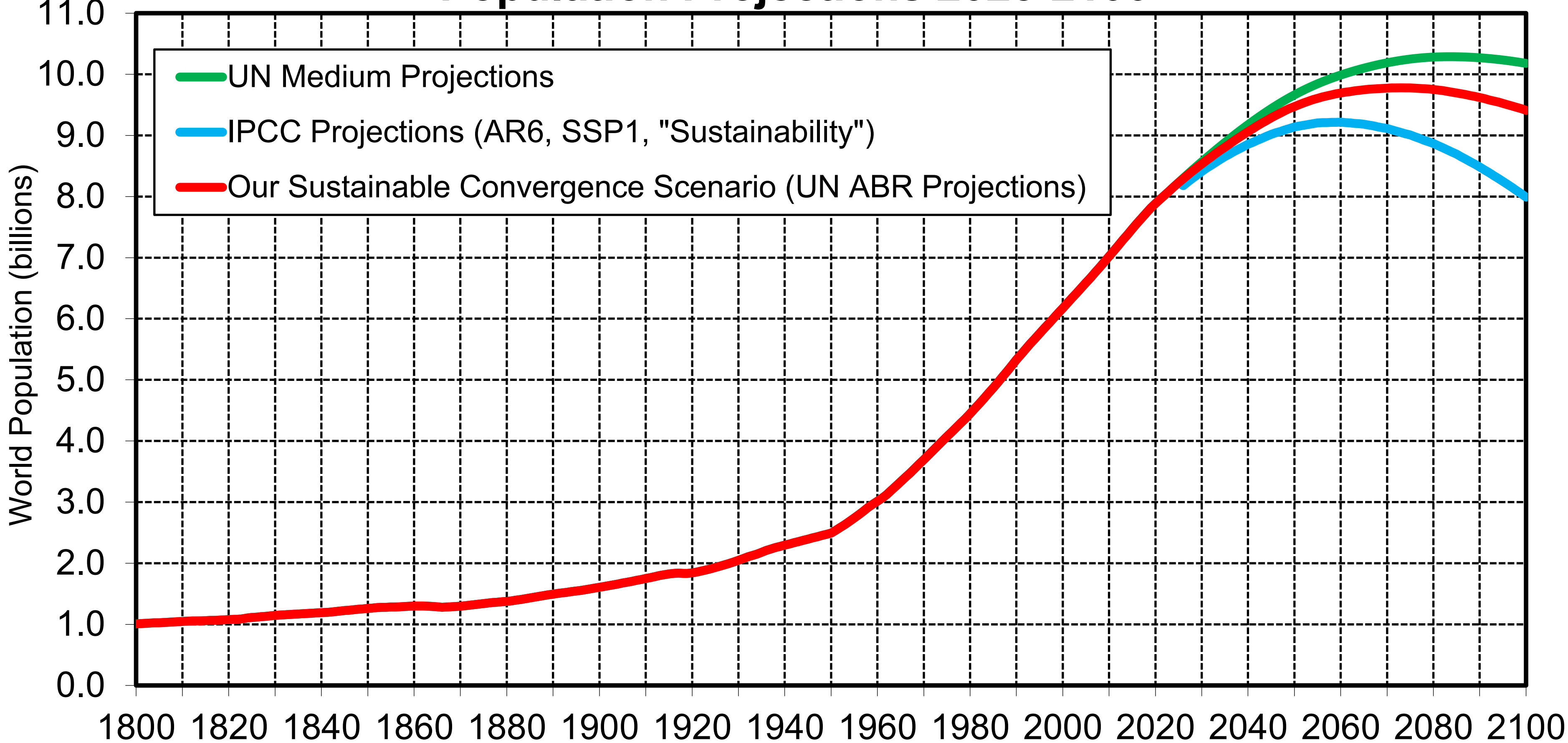
| | **Share of Productivity Gains Devoted to Extra Leisure (vs Extra Production)** |
|---|---|
| **1800-2025** | **32%** |
| incl. 1800-1860 | -4% |
| incl. 1860-1980 | 40% |
| incl. 1980-2025 | -9% |
| **2025-2100 (Sustainable Convergence Scenario)** | **44%** |

**Interpretation**. According to the "sustainable convergence" scenario, 44% of productivity gains will be devoted to extra leisure (as opposed to extra production) at the global level over the 2025-2100 period. This is roughly in line with the historical record observed during the 1860-1980 period (slightly more ambitious). **Source:** wseed.world (F2a)

| Table 11. Hourly GDP Growth Rates, 1950-2100 : Sustainable Convergence Scenario | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Annual growth rates of hourly productivity (GDP per economic labour hour, 2025 PPP Euros) | **World** | **Europe** | **North America/ Oceania** | **Latin America** | **Middle East/North Africa** | **Subsaharan Africa** | **Russia/ Central Asia** | **East Asia** | **South & South-East Asia** |
| 1950-1990 | **2.3%** | **3.8%** | 1.9% | 2.0% | 3.0% | 0.6% | 3.3% | 3.7% | 1.8% |
| 1990-2025 | **1.8%** | 1.5% | 1.7% | 0.7% | 1.4% | 1.1% | 1.3% | **4.7%** | 3.3% |
| 2025-2100 (Sustainable Convergence Scenario) | **2.5%** | 0.9% | 0.8% | 2.6% | 2.1% | **4.5%** | 1.9% | 2.3% | 3.5% |

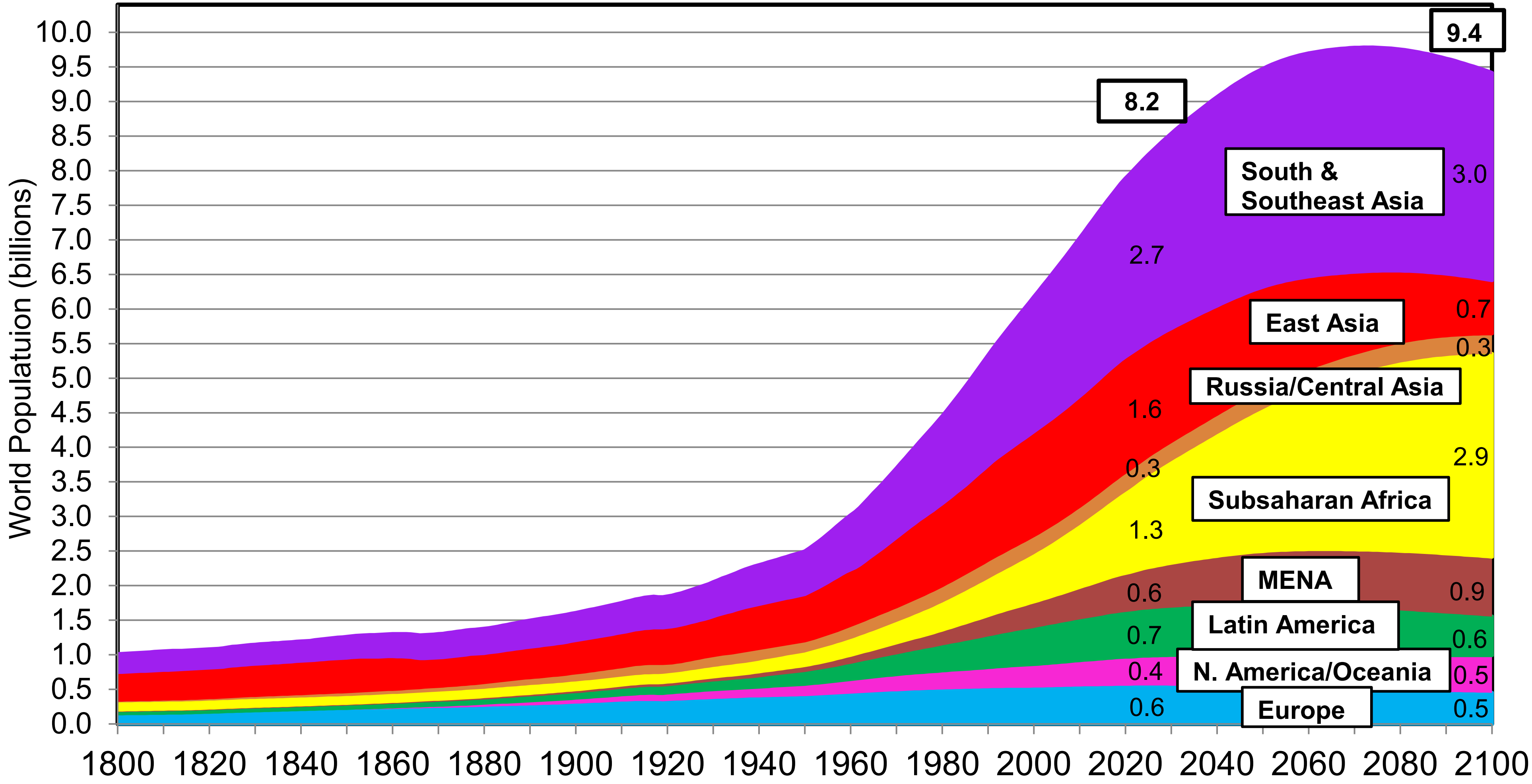
**Interpretation.** According to the "sustainable convergence" scenario, hourly GDP grows at higher speed in poor countries than in rich countries over the 2025-2100 period (especially in Subsaharan Africa, with a productivity growth rate comparable to that observed in Europe over 1950-1990 or in East Asia over 1990-2025), resulting into the same productivity levels in all countries by 2100. **Source:** wseed.world (F2b)

## Fig. 7. Sustainable Convergence Scenario: Population Projections 2025-2100




**Interpretation.** According to our Sustainable Convergence scenario, world population rises from 8.2 billion in 2025 to 9.8 billion in 2070, before declining to 9.4 billion by 2100. This corresponds to UN ABR scenario (accelerated birth rate decline) and leads to smaller 2100 population than UN medium scenario (10.2 billion), thanks to economic convergence. IPCC AR6 SSP1 projections assume an even smaller 2100 population (8.0 billion) and appear to be more restrictive (population-wise) than the most restrictive UN projections. **Sources and series**: wseed.world (Z1a)

# Fig. 8. Sustainable Convergence Scenario: The Geography of Population Growth 2025-2100



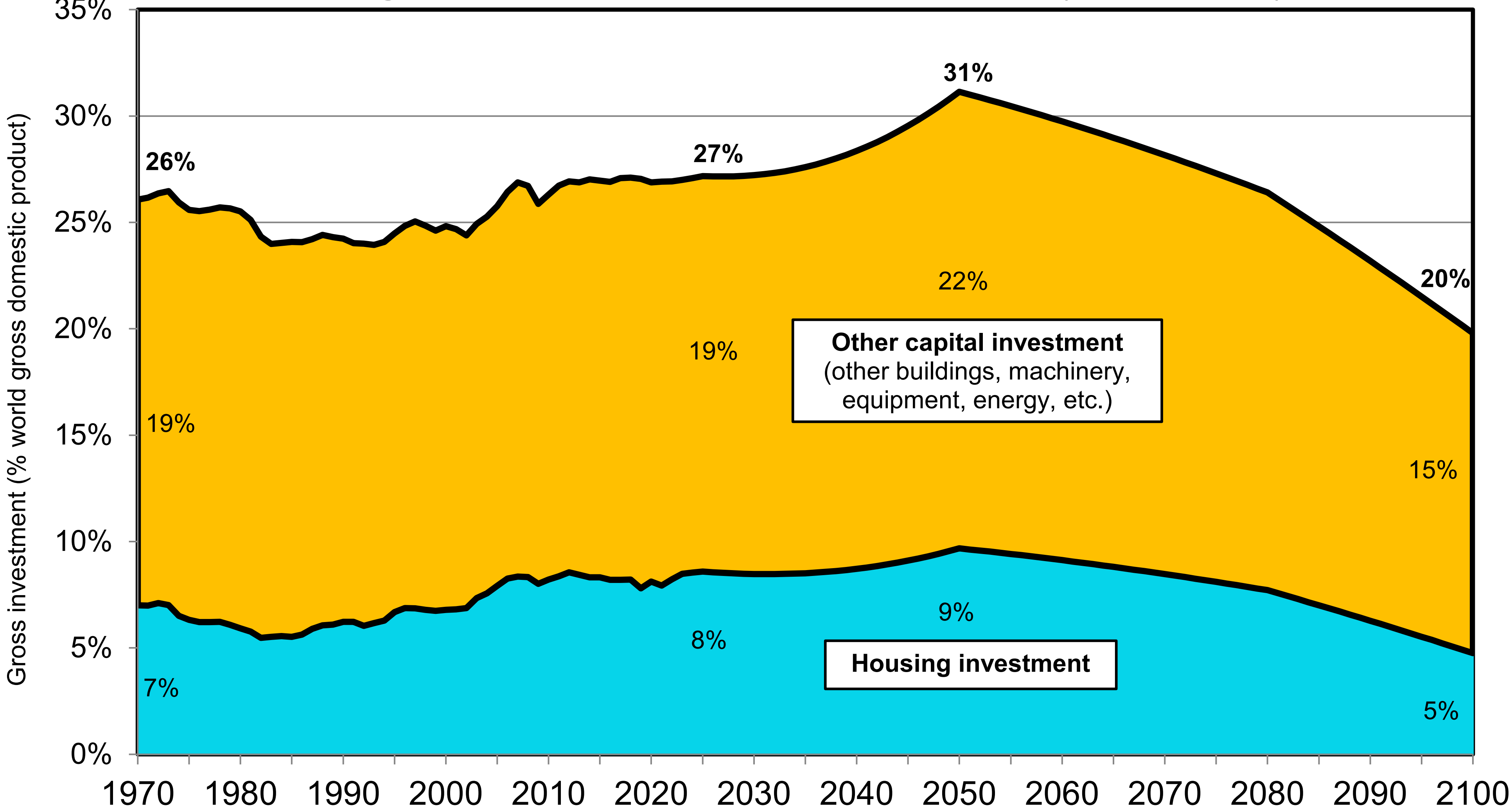

**Interpretation**. According to the Sustainable Convergence scenario (and to all existing population projections), population growth over the 2025-2100 period will come entirely from the world's poorest regions, namely Subsaharan Africa and to a lesser extent South & South-East Asia.
**Sources and series**: wseed.world (Z1b)

## Table 12. The Changing Structure of World Growth, 1800-2100

| (annual growth rate) | **Population** | **Per Capita GDP** | **Total GDP** |
|---|---|---|---|
| **1800-2025** | **0.9%** | **1.3%** | **2.2%** |
| 1800-1910 | 0.5% | 0.7% | 1.3% |
| 1910-1950 | 0.9% | 1.1% | 2.0% |
| 1950-1990 | 1.9% | 2.4% | 4.4% |
| 1990-2025 | 1.2% | 1.9% | 3.1% |
| **2025-2100** | **0.2%** | **1.7%** | **1.9%** |
| 2025-2050 | 0.6% | 1.9% | 2.5% |
| 2050-2080 | 0.1% | 1.8% | 1.9% |
| 2080-2100 | -0.2% | 1.2% | 1.1% |

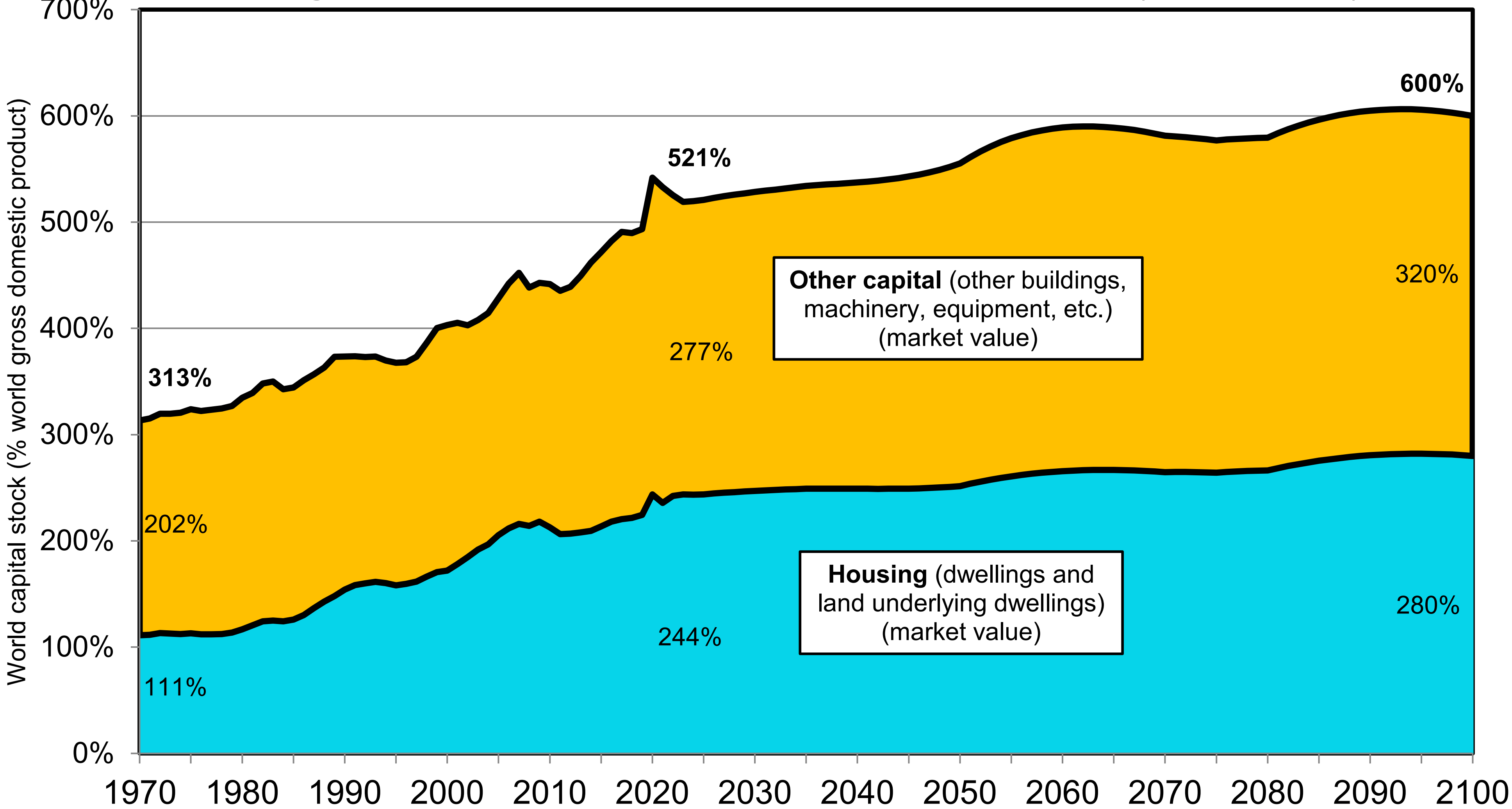
**Interpretation. A**t the world level, population has been rising at 0.9% per year on average between 1800 and 2025, while per capita GDP rose at a rate of 1.3%, resulting into an total growth rate of 2.2% for aggregate GDP. By the end of he 21st century, most or all of the growth will come from per capita GDP. **Source:** wseed.world (Z1b)

# Fig. 9. Gross Investment, 1970-2100 (% world GDP)

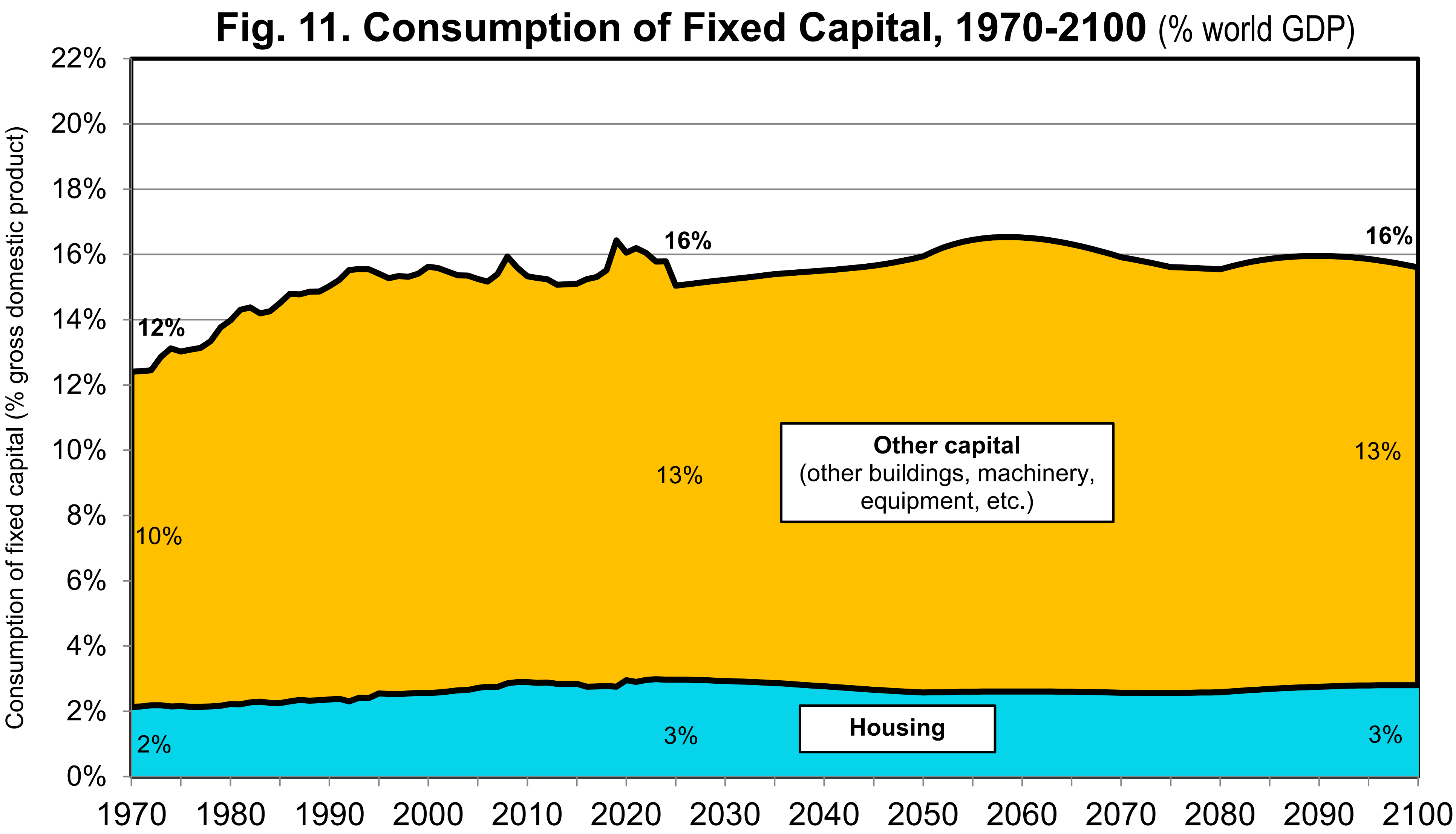



**Interpretation**. At the world level, gross investment rose from 26% of GDP in 1970 (including 7% for housing investment and 19% for other capital investment) to 27% in 2025 (including 8% for housing and 19% for other capital). In our benchmark scenario, it is projected to rise to 31% by 2050 (largely due to the scheduled rise of climate/energy investment) and then to decline to about 20% by 2100 (largely due to the plumetting of population growth). **Sources and series**: wseed.world (J0a)

# Fig. 10. The World Capital Stock, 1970-2100 (% world GDP)

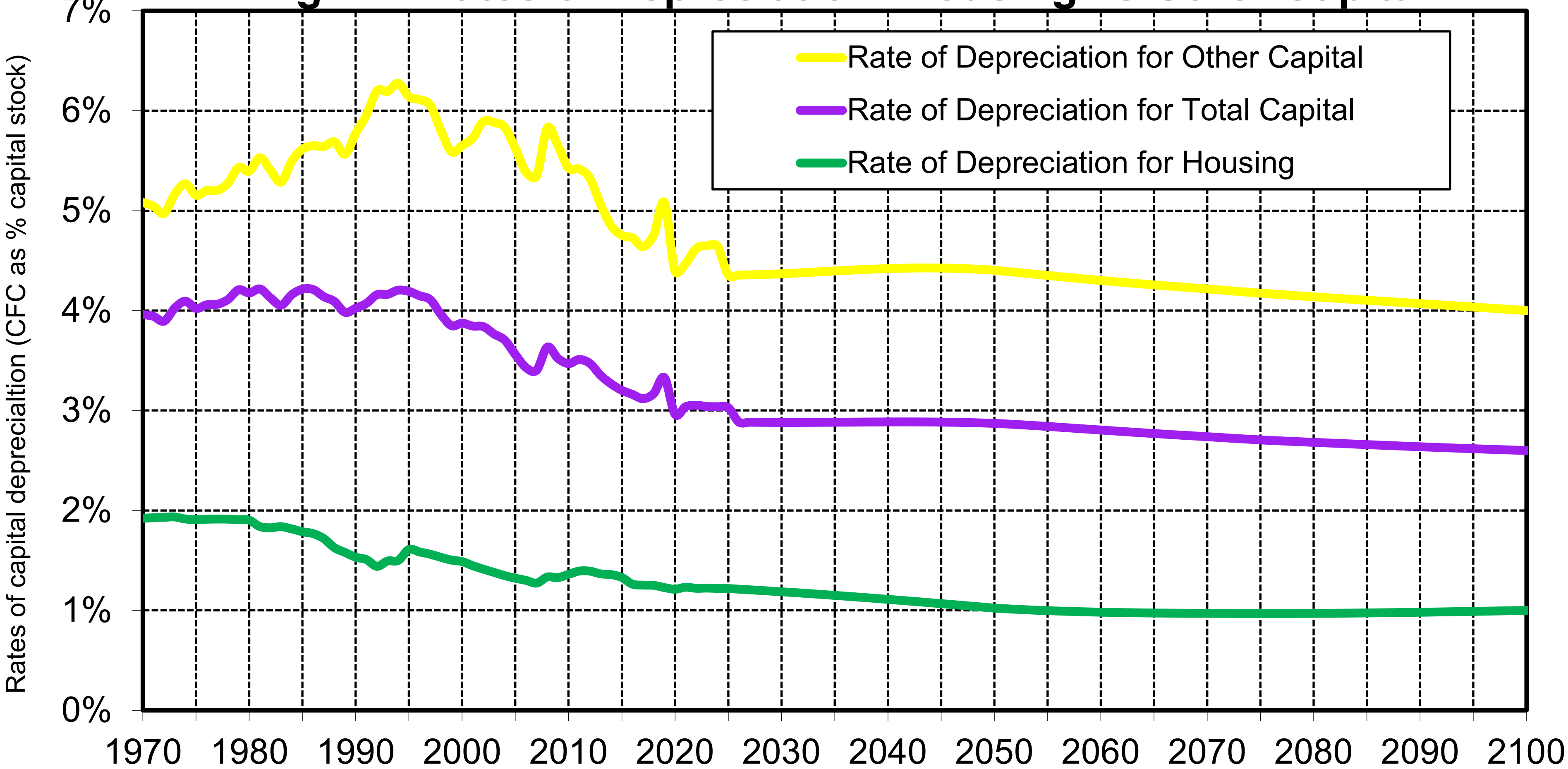



**Interpretation**. At the world level, the total capital stock increased from 313% to 521% of gross domestic product between 1970 and 2025 and is projected to rise to 600% by 2100. The observed rise between 1970 and 2025 and the projected rise between 2025 and 2100 are due both to the rise of housing and other capital (other buildings, machinery, equipment, energy infrastructures, etc.). **Sources and series**: wseed.world (Jk1)



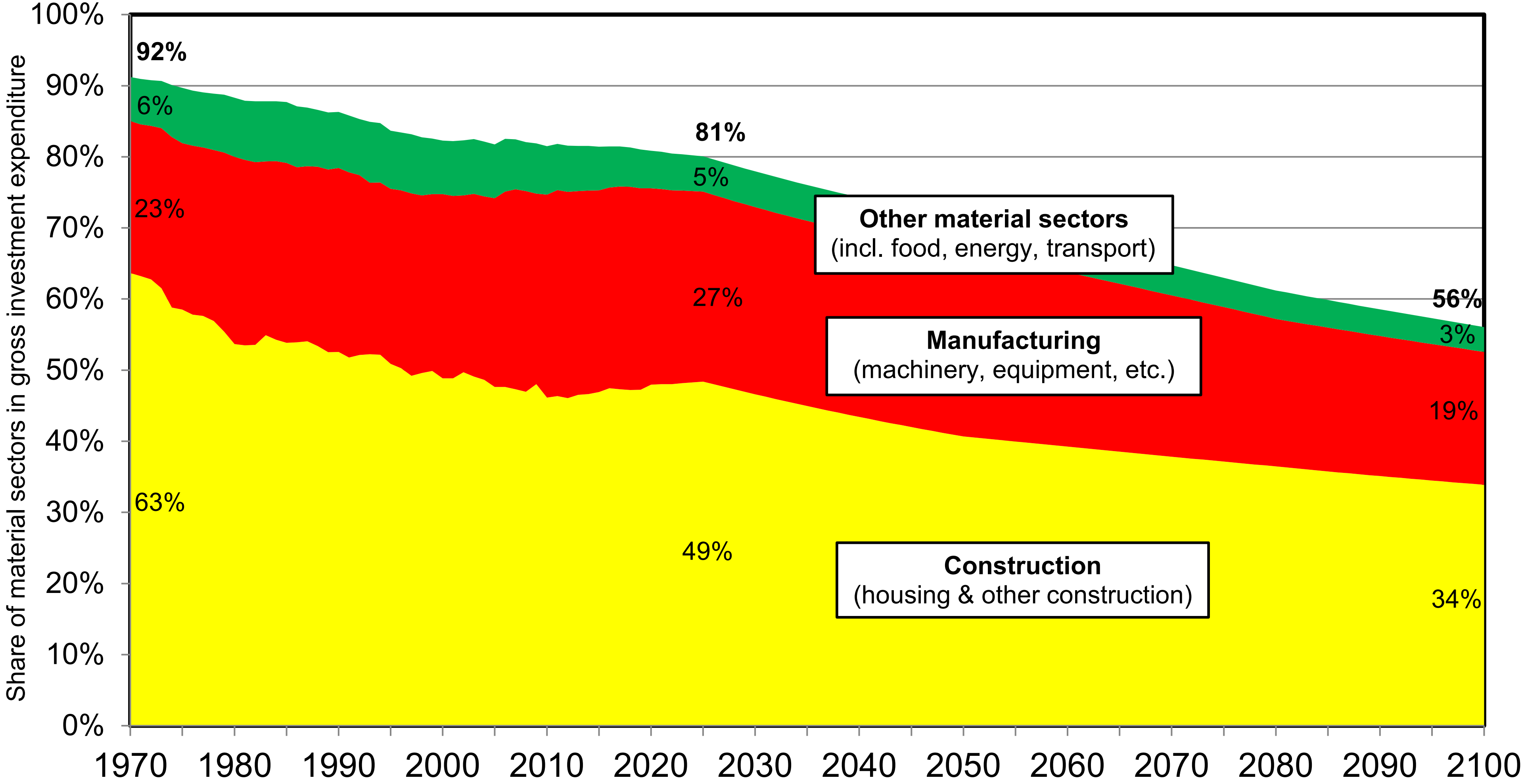

**Interpretation.** At the world level, consumption of fixed capital (capital depreciation) rose from about 12% of GDP in 1970 to 16% in 2025. It is scheduled to stabilize around 16% of GDP over the 2025-2100 period. Observed series 1970-2025. **Sources and series**: wseed.world (J0b)

# Fig. 12. Rates of Depreciation: Housing vs Other Capital



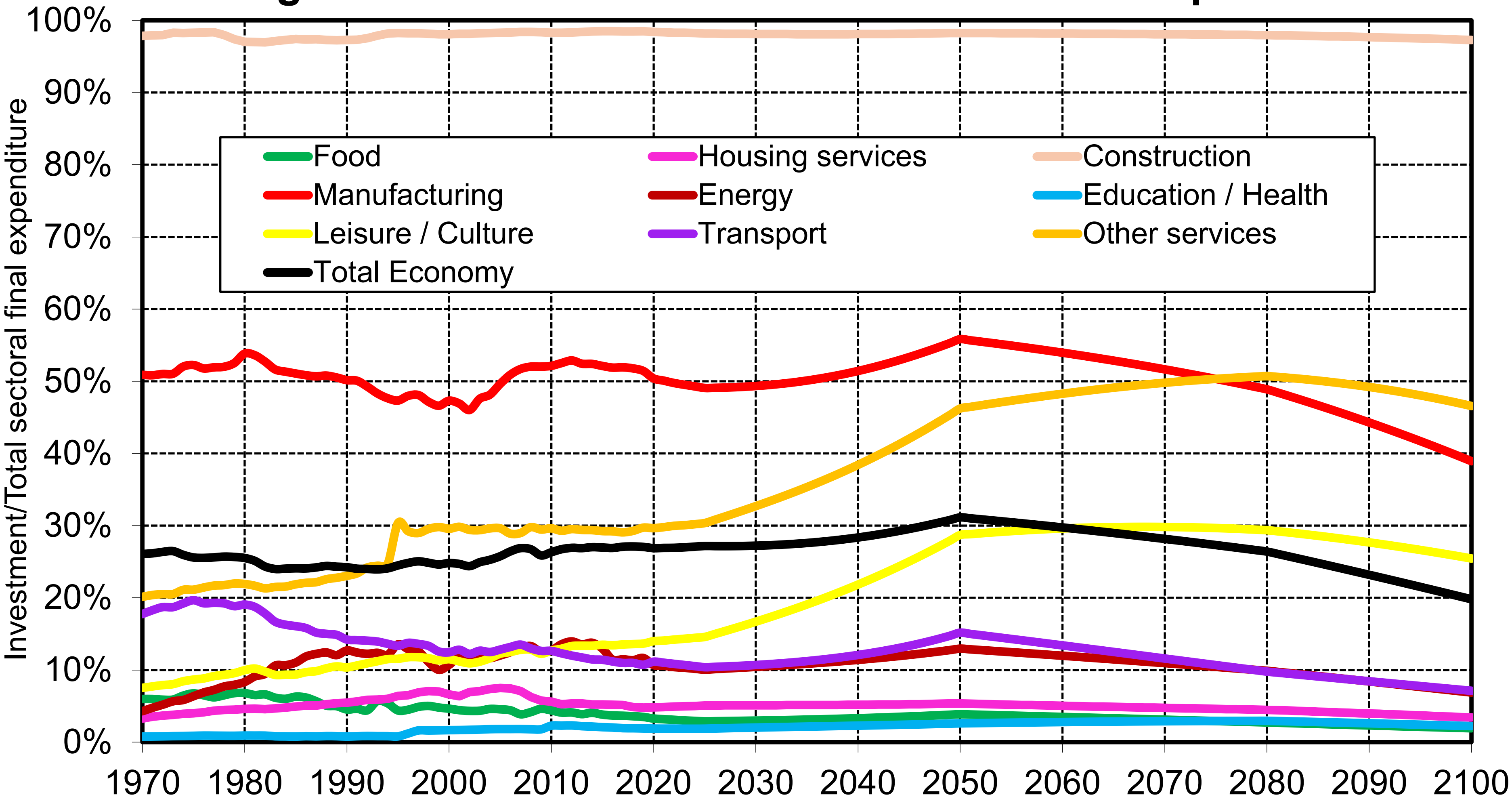

**Interpretation**. At the world level, the rate of capital depreciation (i.e. consumption of fixed capital as a fraction of capital stock) declined from 4.0% in 1970 to 3.0% in 2025 and is projected to further decrease to 2.6% by 2100. Depreciation rates for housing have always been smaller than for other capital, reflecting higher obsolescence of other capital (other buildings, machinery, equipment, etc.). Falling depreciation rates reflect various factors, including rising asset values, especially over the 1990-2025 period. I.e. consumption of fixed capital did rise as a fraction of GDP (from 12% to 16% between 1970 and 2025), but less so than the total market value of capital stock. **Sources and series**: wseed.world (J0c)

# Fig. 13. Sustainable Convergence Scenario: Reduced Share of Material Sectors in Investment



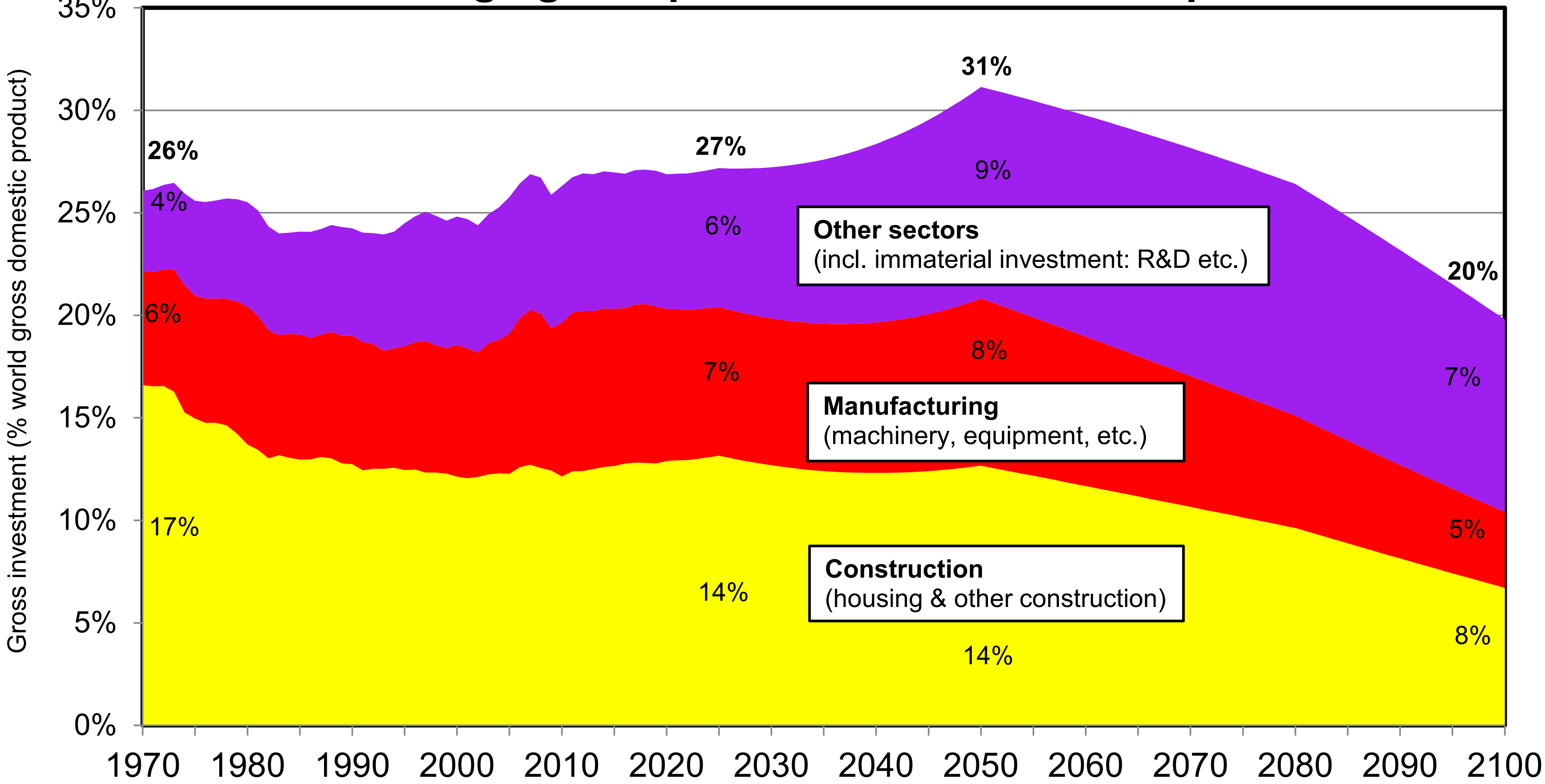

**Interpretation**. The share of material sectors in final consumption expenditure rose from 92% to 81% at the world level between 1970 and 2025. It is a projected to decline to 56% by 2100 according to our Sustainable Convergence scenario. This corresponds to a 30% reduction in the share of material sectors in investment expenditure. **Sources and series**: wseed.world (J0m)

## Fig. 14. Investment Share in Gross National Expenditure



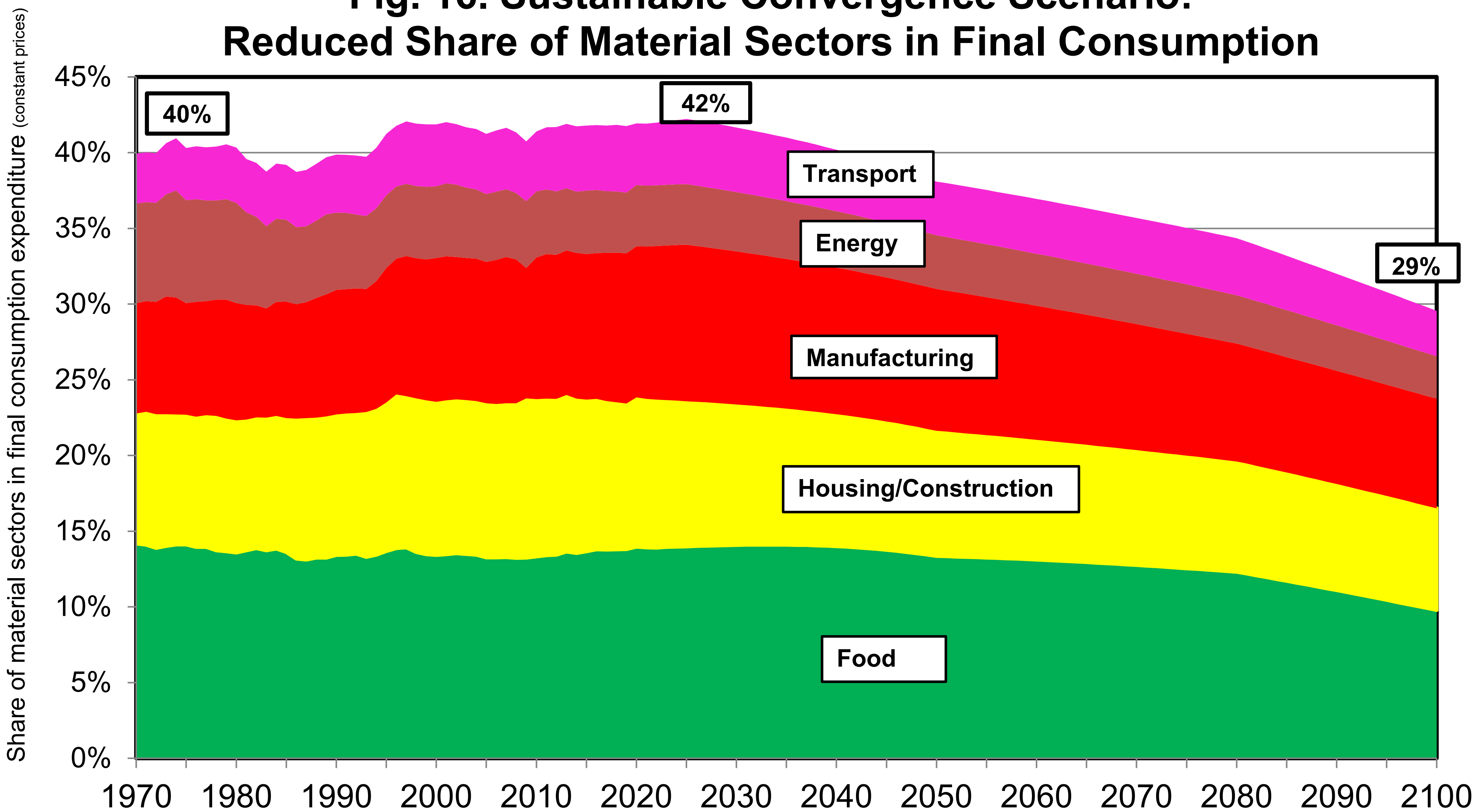

**Interpretation**. The share of investment in gross national expenditure (final consumption + investment) has always been around 95-100% in construction, 50% in manufacturing and less than 10% in most other sectors, with the exception of other services, where the investment share rose from 20% to 30% between 1970 and 2025 and is projected to reach 47% by 2100. **Sources and series**: wseed.world (J0n)

## Fig. 15. Sustainable Convergence Scenario: The Changing Composition of Investment Expenditure



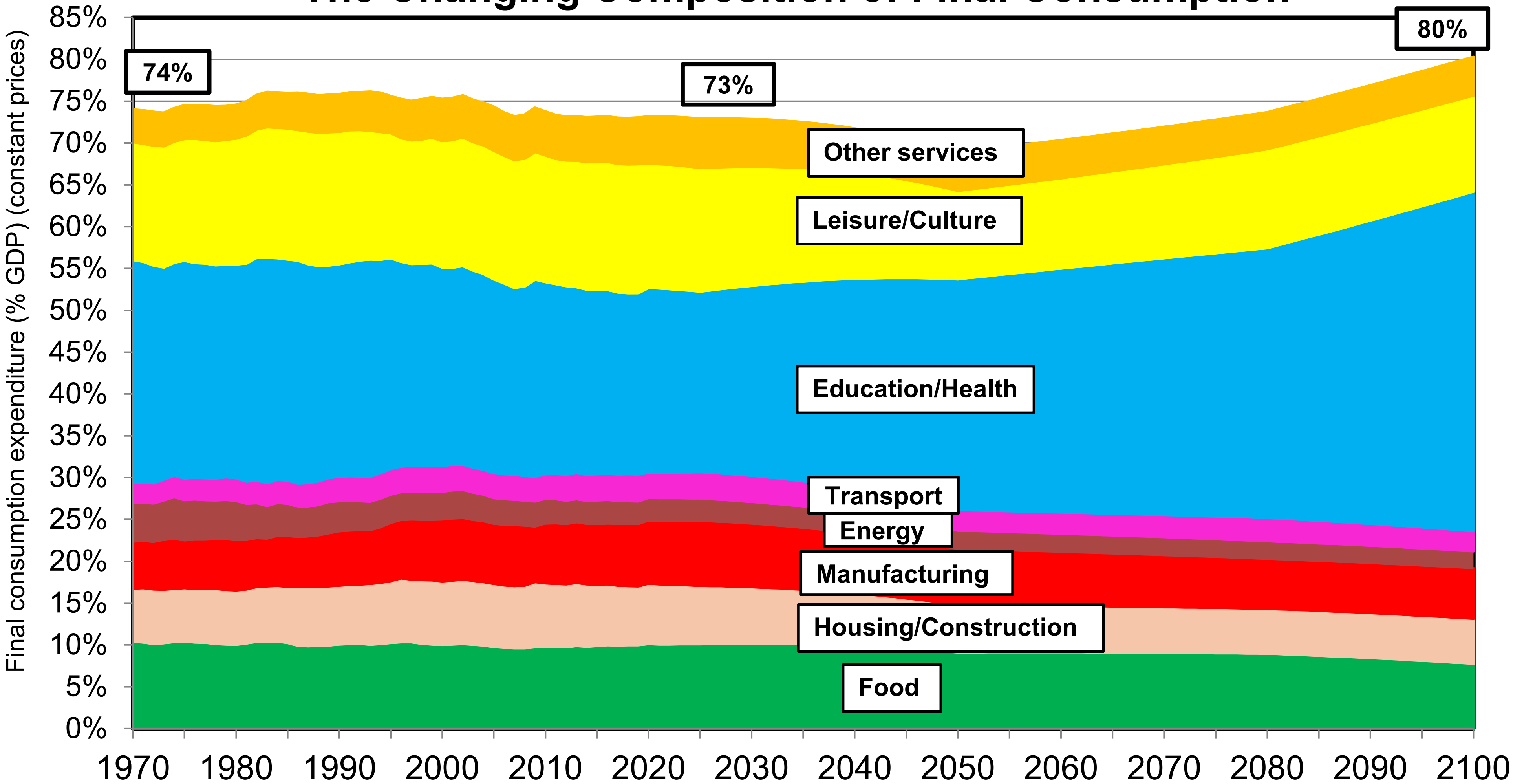

**Interpretation**. At the world level, gross investment rose from 26% of gross domestic product in 1970 to 27% in 2025. In our benchmark scenario, it is scheduled to rise until 2050-2060 and then to decline to about 20% by 2100, with a rising fraction of investment expenditure originating from sectors other than construction and manufacturing. **Sources and series**: wseed.world (J0o)

# Fig. 16. Sustainable Convergence Scenario: Reduced Share of Material Sectors in Final Consumption



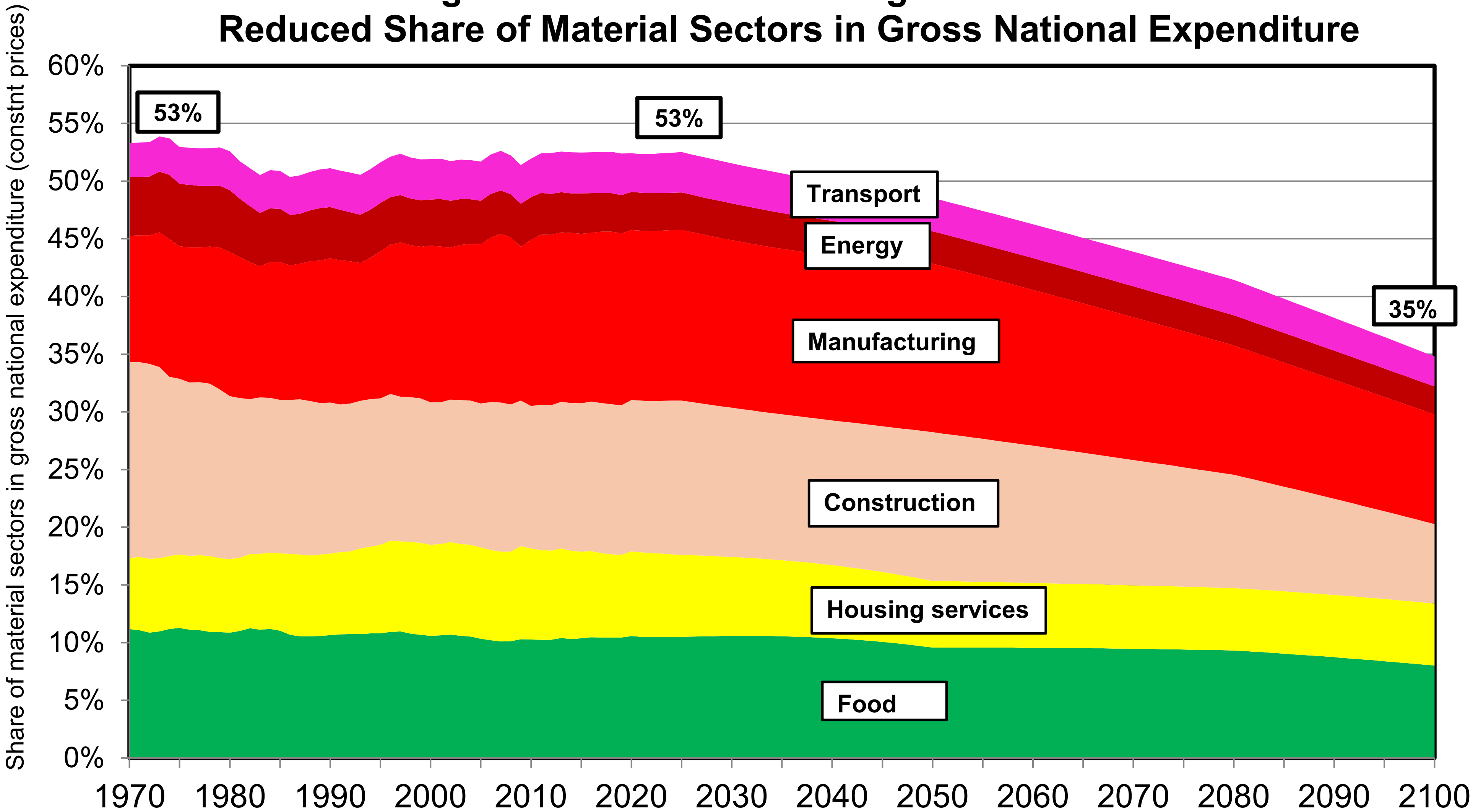

**Interpretation**. The share of material sectors in final consumption expenditure rose from 40% to 42% at the world level between 1970 and 2025. It is a projected to decline to 29% by 2100 according to our Sustainable Convergence scenario. This corresponds to a 30% reduction in the share of material sectors in final consumption expenditure. **Sources and series**: wseed.world (I0m)

# Fig. 17. Sustainable Convergence Scenarion: The Changing Composition of Final Consumption



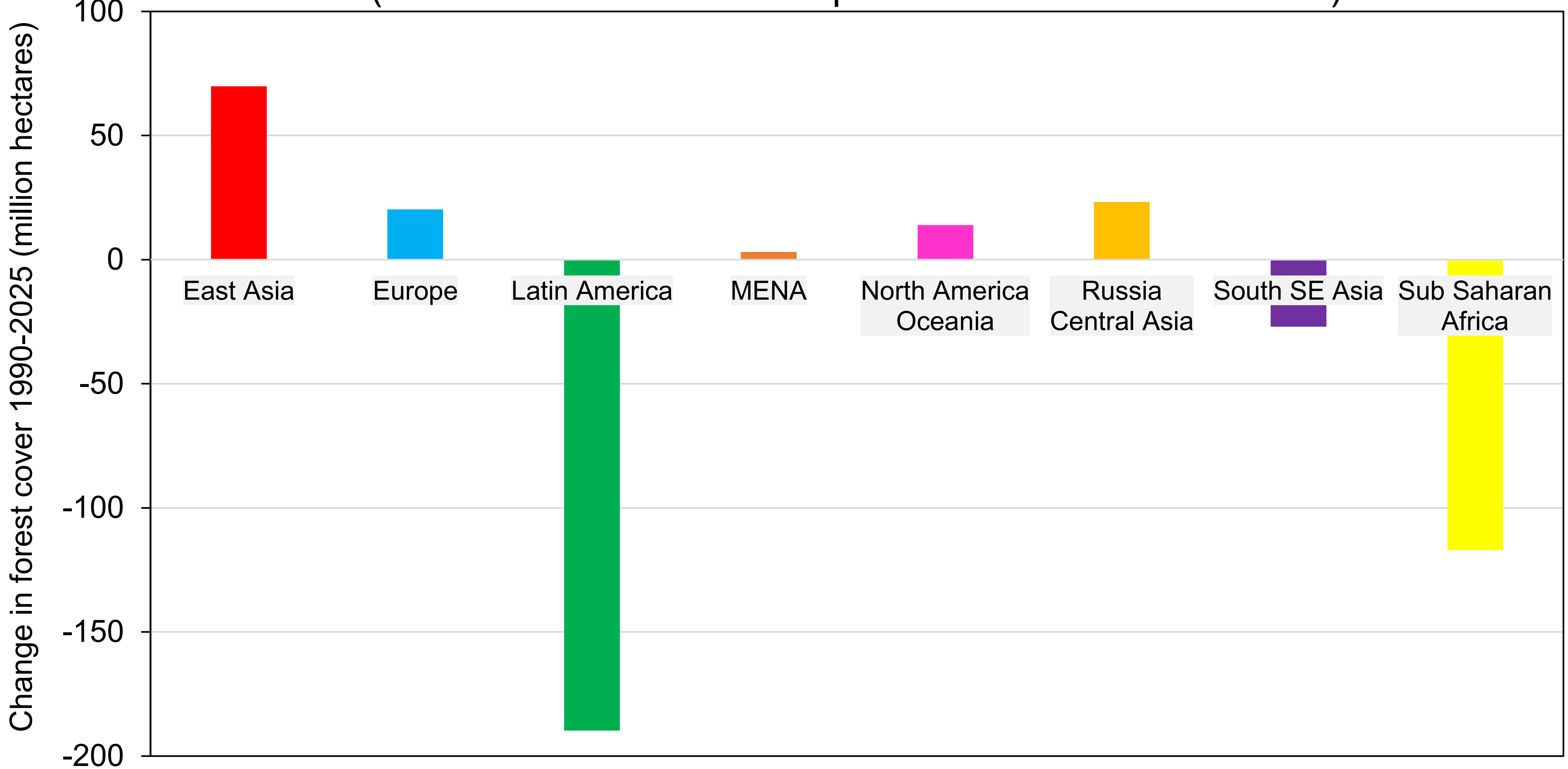

**Interpretation**. The share of immmaterial sectors (particularly education/health) in final consumption expenditure is scheduled to rise between 2025 and 2100 according to our Sustainable Convergence scenario. Aggregate final consumption is also scheduled to rise from 73% to 80% of GDP at the world level, as gross investment declines from 27% to 20%. **Sources and series**: wseed.world (I0r)

# Fig. 18. Sustainable Convergence Scenario: Reduced Share of Material Sectors in Gross National Expenditure



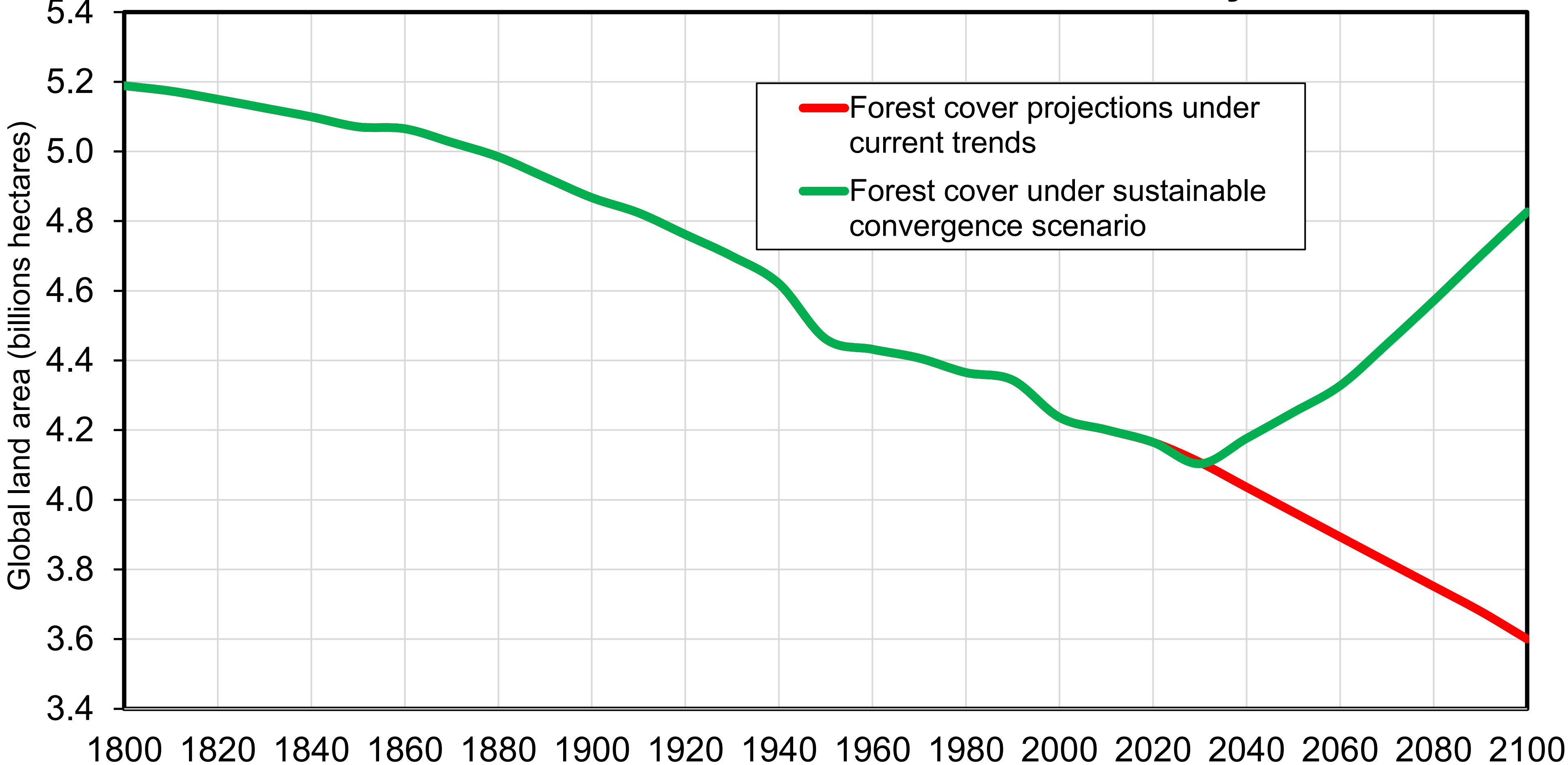

**Interpretation**. The share of material sectors in gross national expenditure (final consumption and investment) remained stable at 53% at the world level between 1970 and 2025. It is a projected to decline to 35% by 2100 according to our Sustainable Convergence scenario. This corresponds to a 30% reduction in the share of material sectors in consumption and investment expenditure. **Sources and series**: wseed.world (G0m)

## Fig. 19. Change in forest cover across world regions 1990-2025
(Global evolution over the period: -203 million hectares)



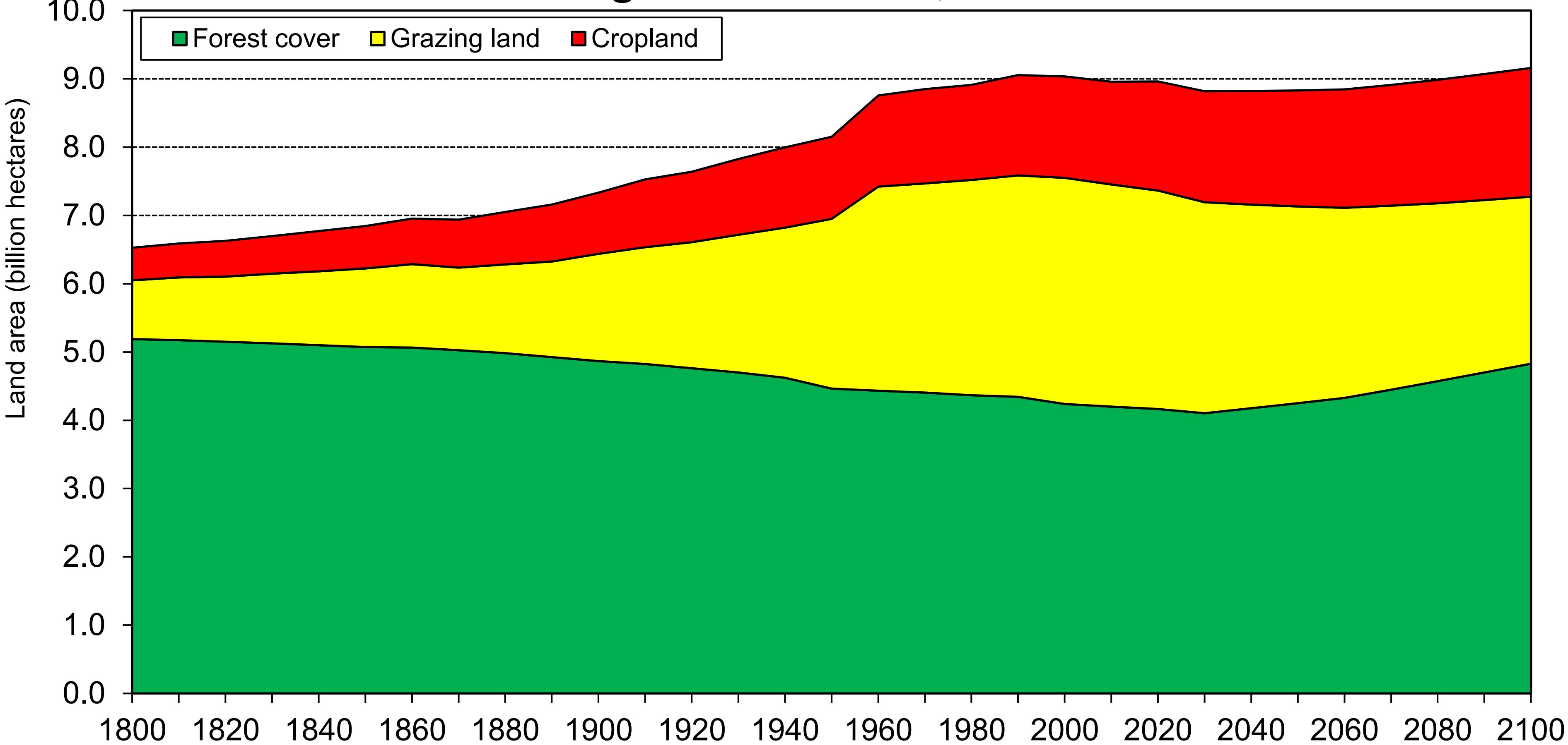

**Interpretation.** Global forest area declined by 203 millions hectares between 1990 and 2025 (in line with the long run decline of about 1.1 billion hectares observed between 1800 and 2025). This continued global forest decline results from large deforestation in the global South (Latin America, Subsaharan Africa, South & South-East Asia) and small reforestation in the global North (East Asia, Europe, North America, Russia). In addition, the areas which are currently under deforestation include denser forests with much stronger CO2 absorption capacities per hectare (two to three times larger) than the areas under reforestation. **Sources and series**: wseed.world (U2)

# Fig. 20. Sustainable Convergence: Deforestation Ban in 2030 & Gradual Return of Forest Cover to 1900 Level by 2100

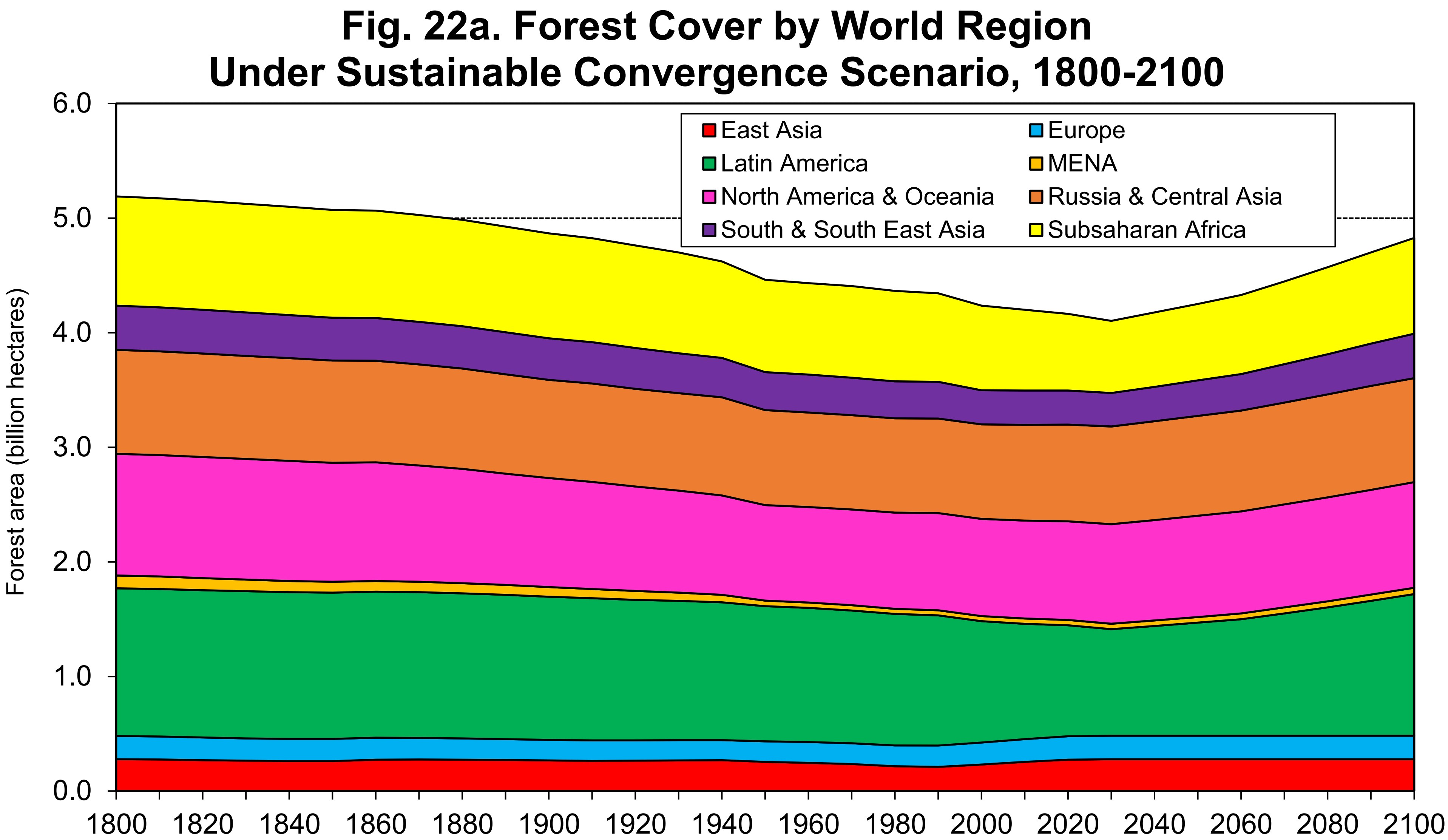



**Interpretation.** According to our Sustainable Convergence scenario, a complete ban on deforestation will be imposed in 2030 and a large reforestation plan will allow global forest cover to gradually rise from about 4.1 billion hectares in 2025 to 4.8 billion by 2100, i.e. approximately the same level as in 1900. In contrast, in the Productivist Convergence and Persistent Inequality scenarios, deforestation is expected to continue at the same speed as in recent decades, so that global forest cover will reach about 3.6 billion by 2100. **Sources and series**: wseed.world (U3)

## Fig. 21. Global Agricultural Land (Grazing Land and Cropland) and Forest Cover under the Sustainable Convergence Scenario, 1800-2100

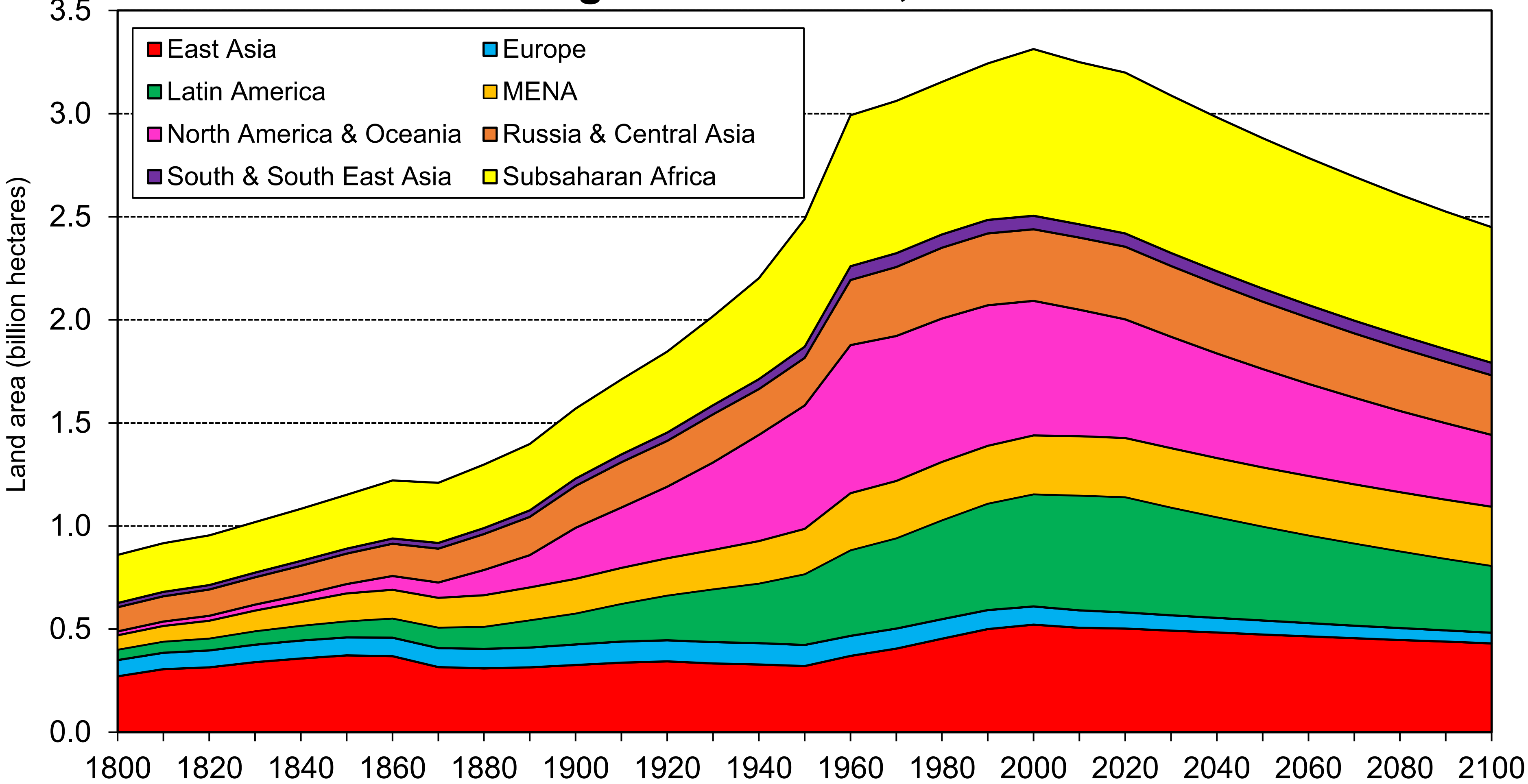



**Interpretation.** According to our Sustainable Convergence scenario, global forest cover rises from 4.1 billions hectares in 2025 to 4.8 billions by 2100 (i.e. approximately the same level as in 1900), while grazing land declines sharply from 3.2 to 2.4 billions and cropland rises moderately from 1.6 to 1.9 billions (in order to make up for the shift from meat to vegetables). **Sources and series**: wseed.world (U4)



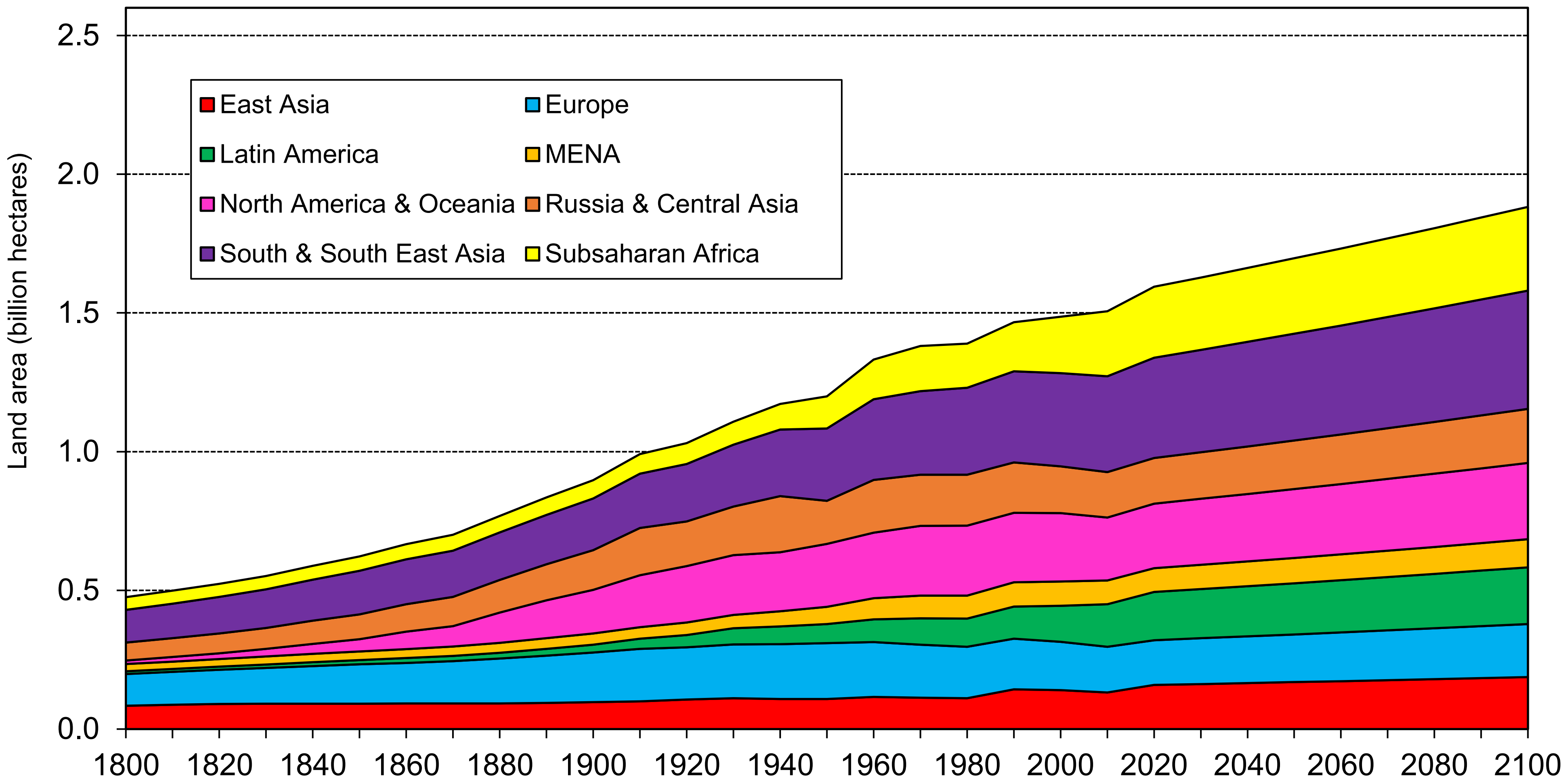

**Interpretation.** According to our Sustainable Convergence scenario, global forest cover rises from 4.1 billions hectares in 2025 to 4.8 billions by 2100 (i.e. approximately the same level as in 1900), with large increases in all regions. **Sources and series**: wseed.world (U5a)

# Fig. 22b. Grazing Land by Region Under Sustainable Convergence Scenario, 1800-2100



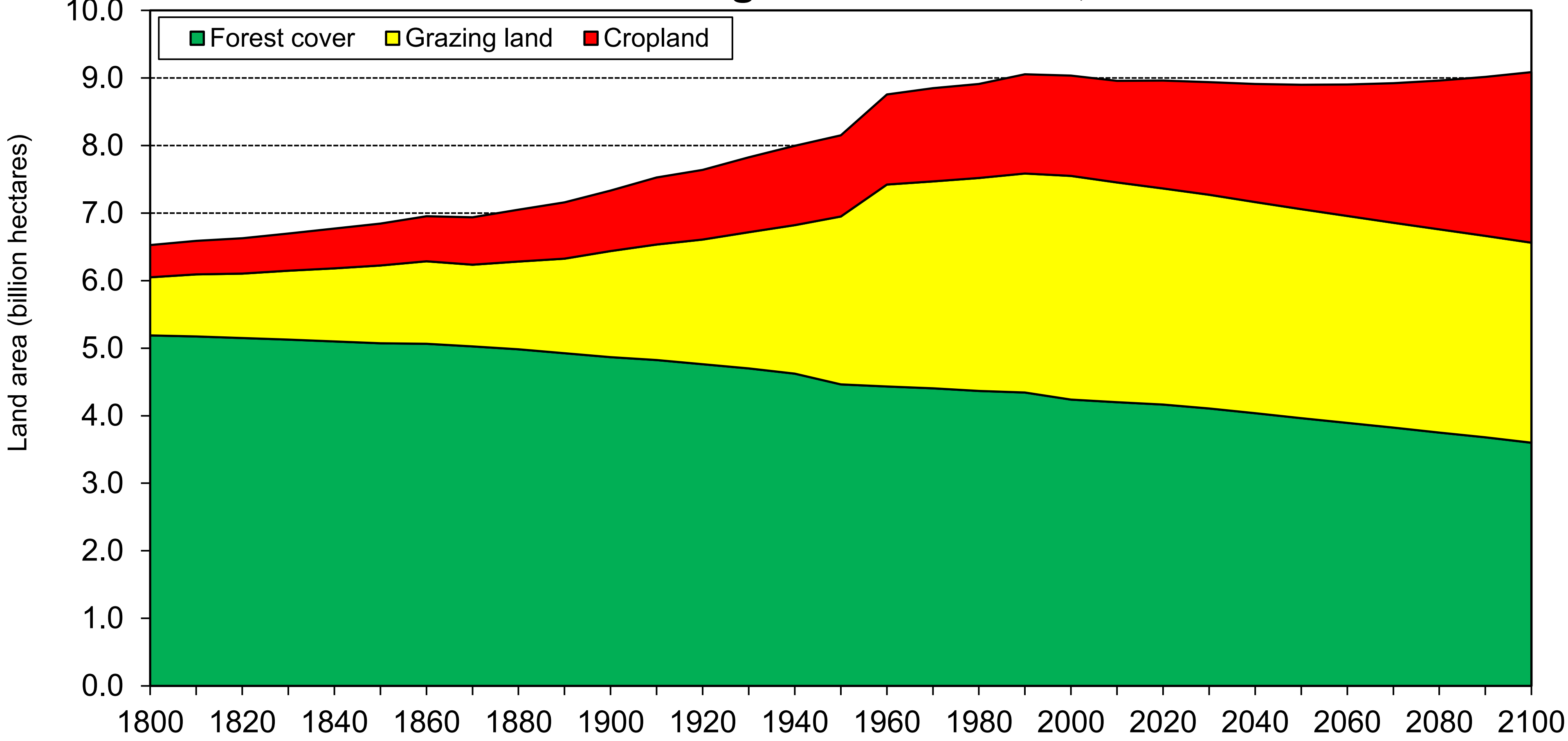

**Interpretation.** According to our Sustainable Convergence scenario, grazing land declines from 3.2 to 2.4 billions hectares between 2025 and 2100, with large declines in all regions. **Sources and series**: wseed.world (U5b)

# Fig. 22c. Cropland by Region Under Sustainable Convergence Scenario, 1800-2100



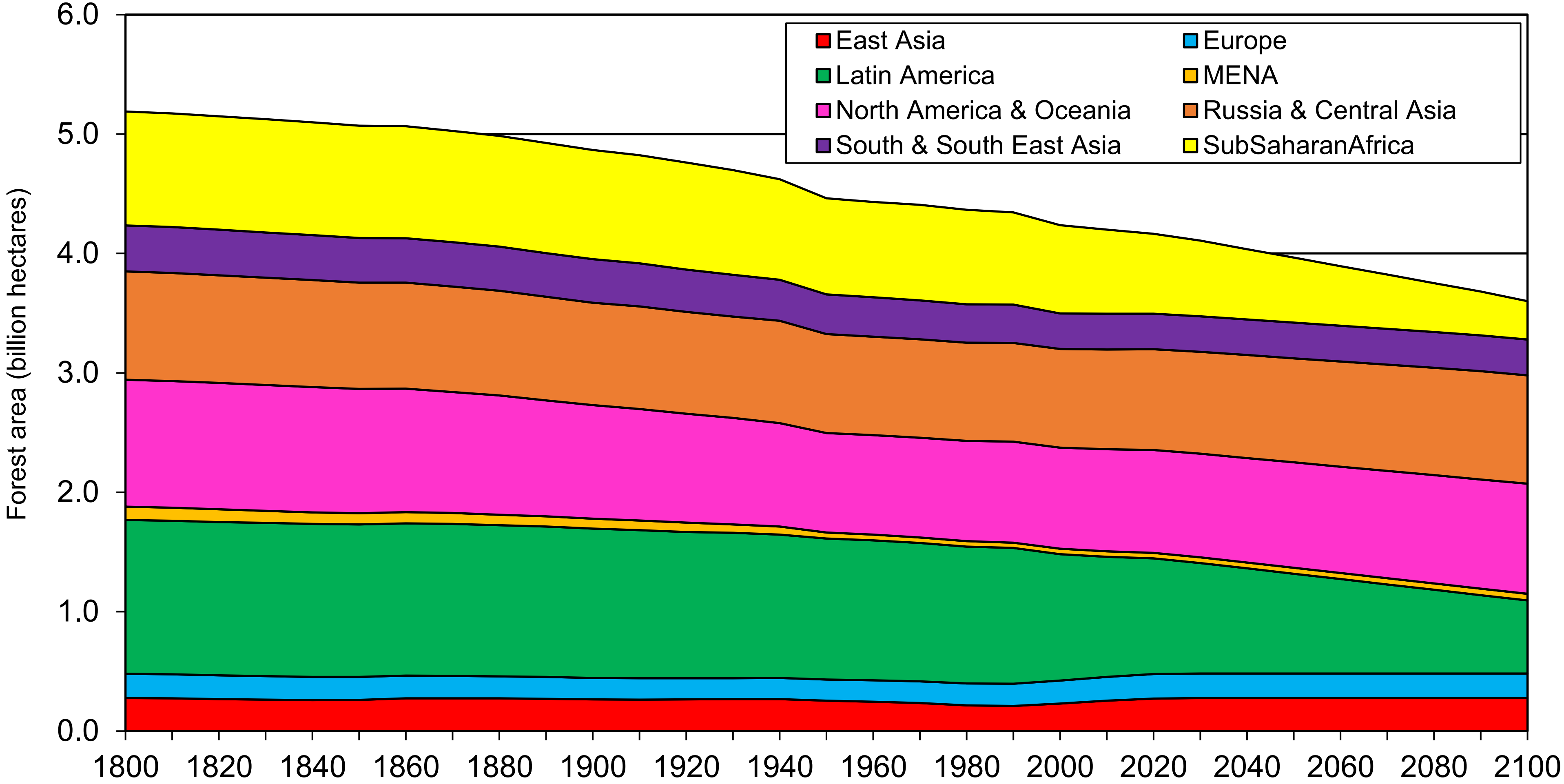

**Interpretation.** According to our Sustainable Convergence scenario, cropland rises moderately from 1.6 to 1.9 billions between 2025 and 2100 (in order to make up for the shift from meat to vegetables), with moderate increases in all regions. **Sources and series**: wseed.world (U5c)

## Fig. 23. Global Agricultural Land (Grazing Land and Cropland) and Forest Cover under Persistant Inequality and Productivist Convergence Scenarios, 1800-2100



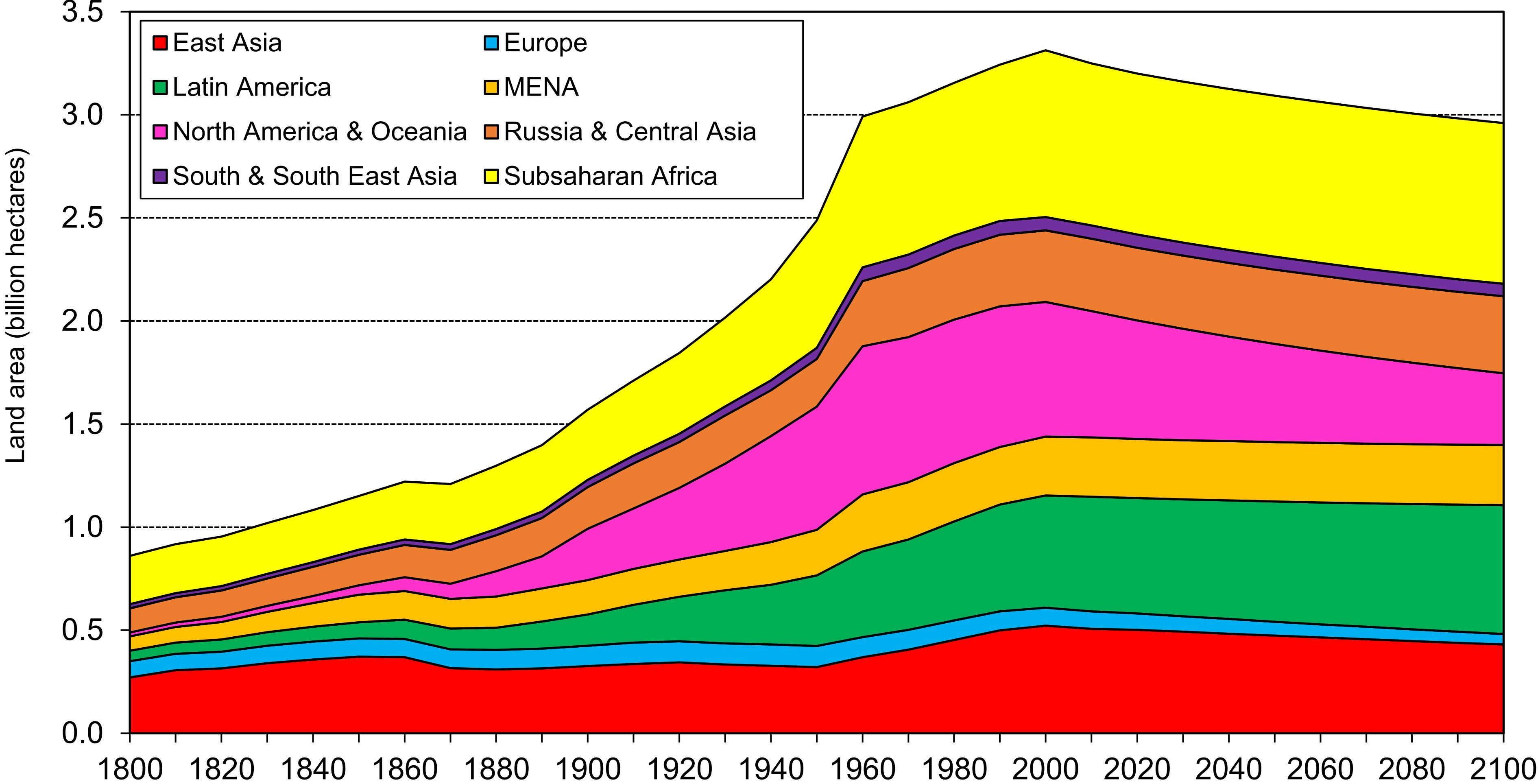

**Interpretation.** According to the Productivist Convergence and Persistent Inequality scenarios, global forest cover declines from 4.1 billions hectares in 2025 to 3.6 billions by 2100, while grazing land declines slightly from 3.2 to 3.0 billions and cropland rises from 1.6 to 2.5 billions.
**Sources and series**: wseed.world (U6)

## Fig. 24a. Forest Cover by World Region Under Persistent Inequality and Productivist Convergence Scenarios



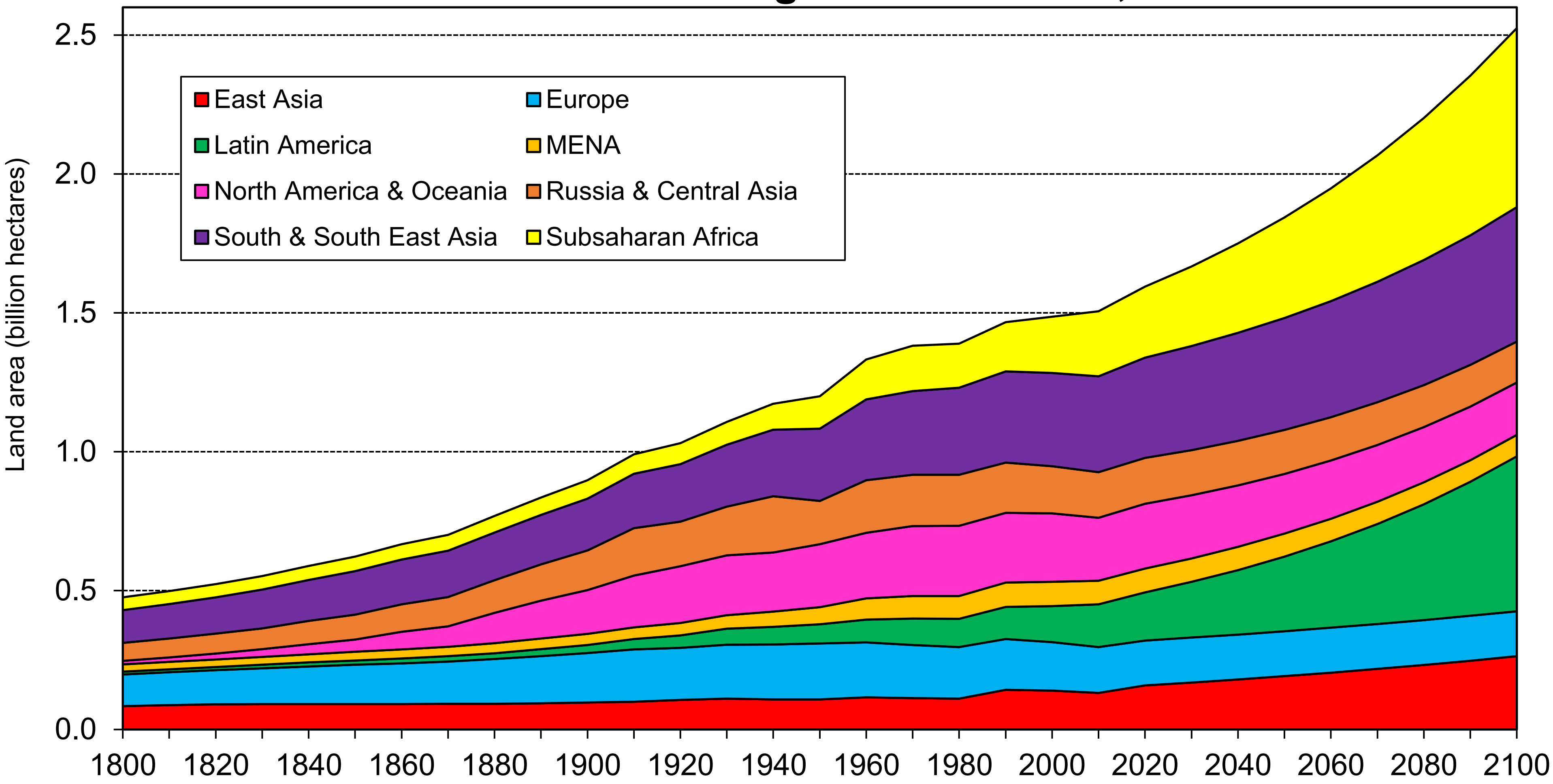

**Interpretation.** According to the Productivist Convergence and Persistent Inequality scenarios, global forest cover declines from 4.1 billions hectares in 2025 to 3.6 billions by 2100, with large declines in most regions. **Sources and series**: wseed.world (U7a)

# Fig. 24b. Grazing Land by Region Under Persistent Inequality and Productivist Convergence Scenarios



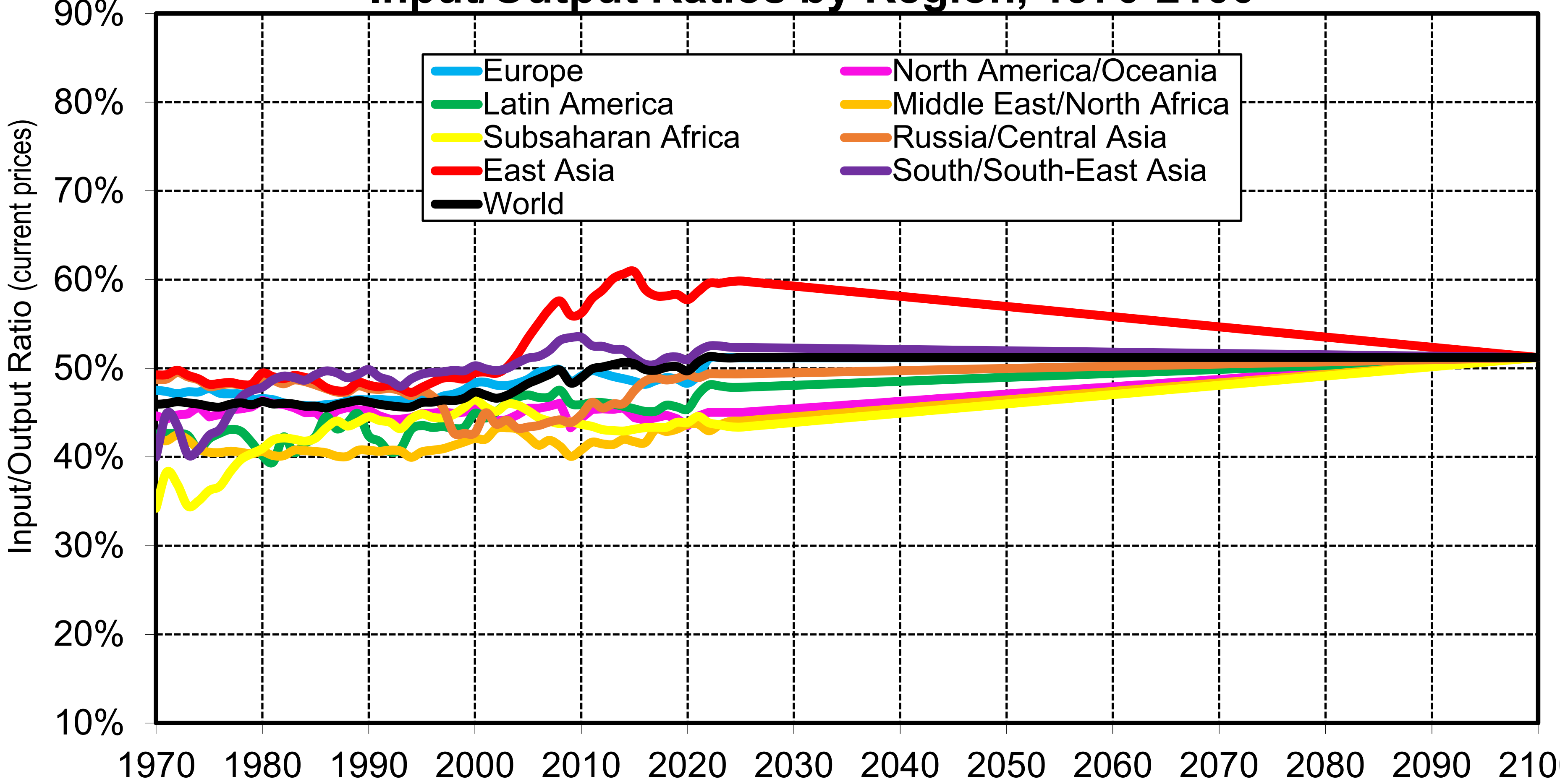

**Interpretation.** According to the Productivist Convergence and Persistent Inequality scenarios, grazing land declines slightly from 3.2 to 3.0 billions between 2025 and 2100, with small declines in most regions. **Sources and series**: wseed.world (U7b)

**Fig. 24c. Cropland by Region Under Persistent Inequality and Productivist Convergence Scenarios, 1800-2100**



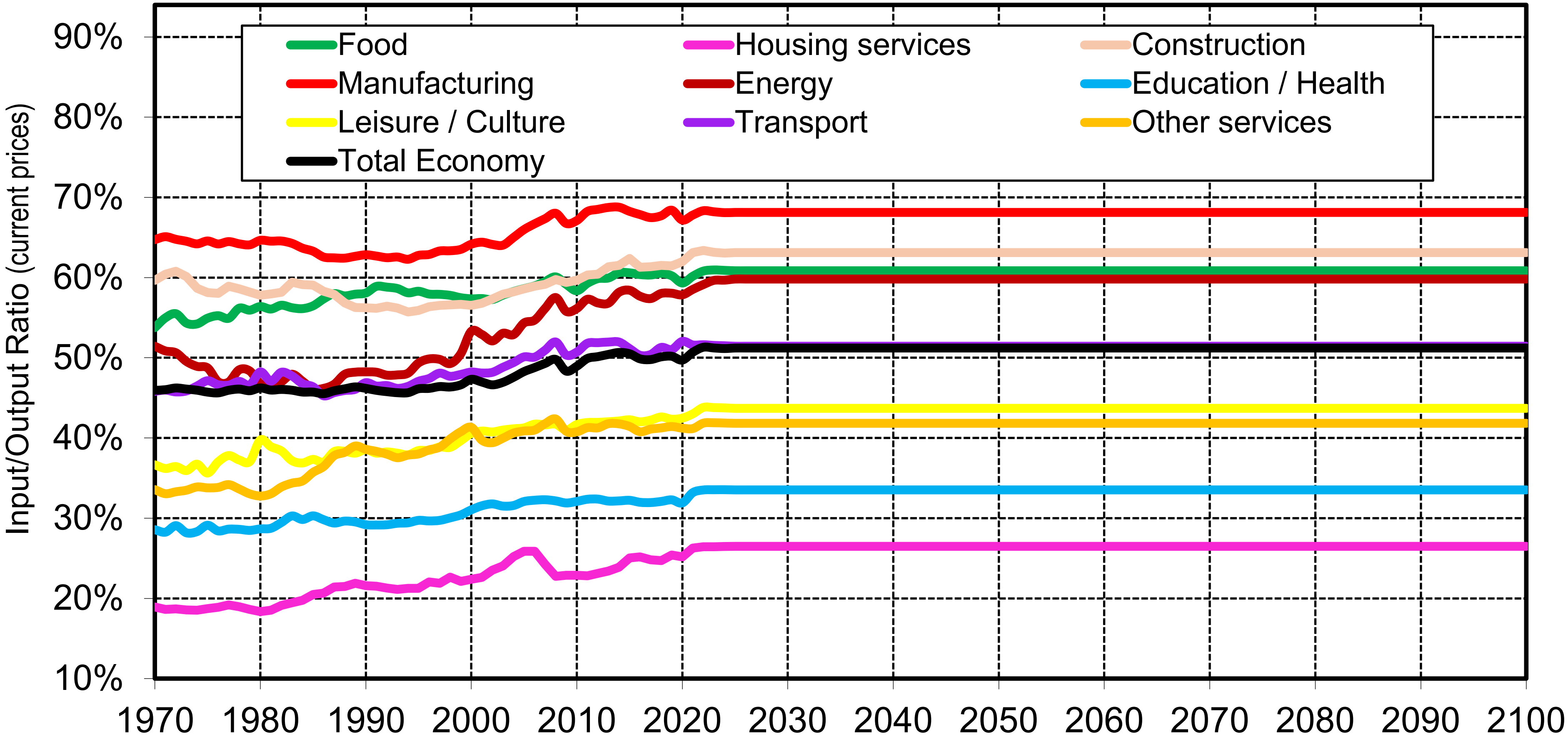

**Interpretation.** According to the Productivist Convergence and Persistent Inequality scenarios, cropland rises from 1.6 to 2.5 billions between 2025 and 2100, with increases in most regions. **Sources and series**: wseed.world (U7c)

## Fig. 25. The Evolution of Input-Output Matrices: Input/Output Ratios by Region, 1970-2100



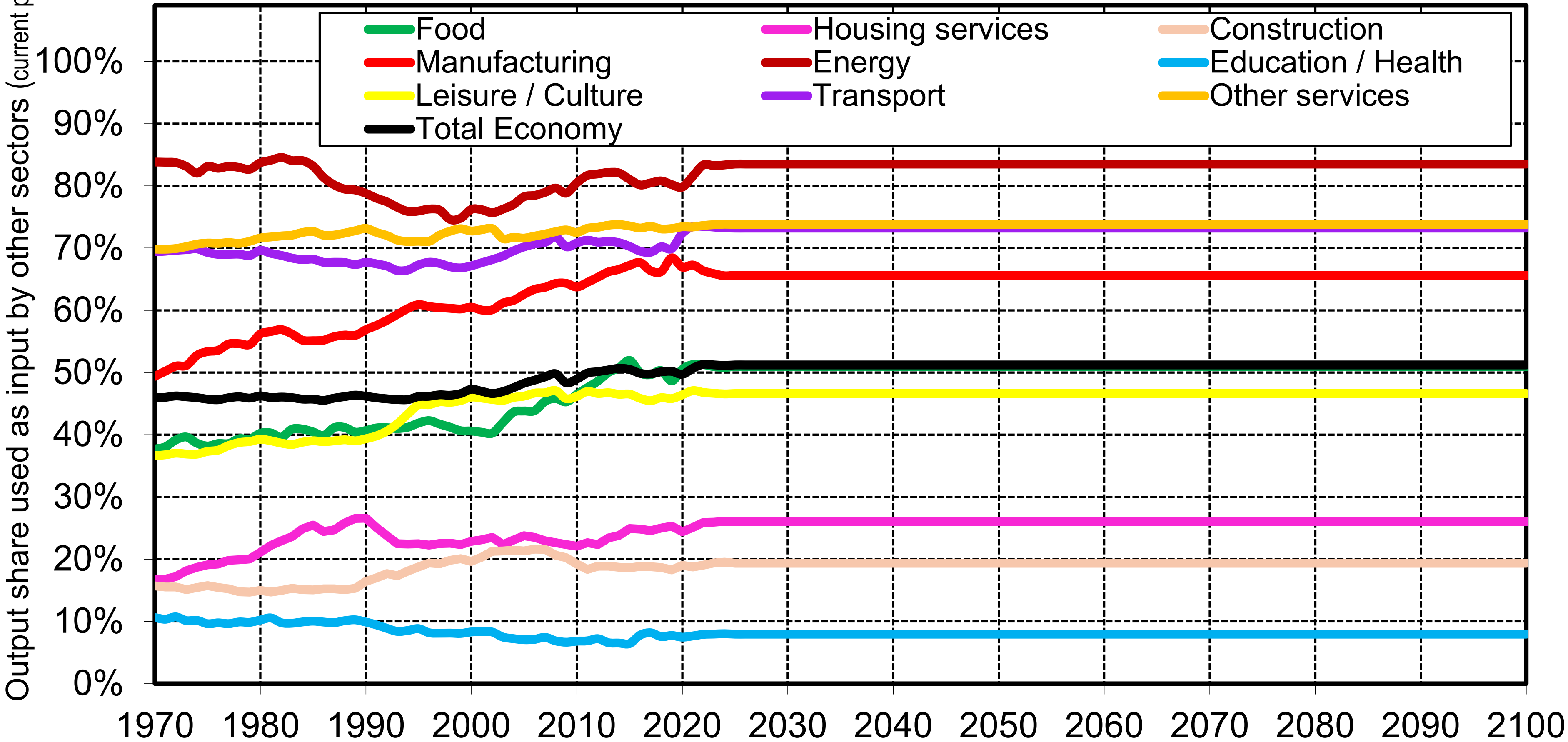

**Interpretation.** At the world level, intermediate inputs made on average 46% of total output in 1970 (all sectors combined). The global input-output ratio rose to 52% by 2025, with moderate variations across regions. East Asia's high ratio is due to the large manufacturing sector. In our benchmark simulations, we assume that this ratio will converge to 52% in all countries by 2100. **Sources and series**: wseed.world (O0)

## Fig. 26. The Evolution of Input-Ouput Matrices: Input/Output Ratios by Sector, 1970-2100



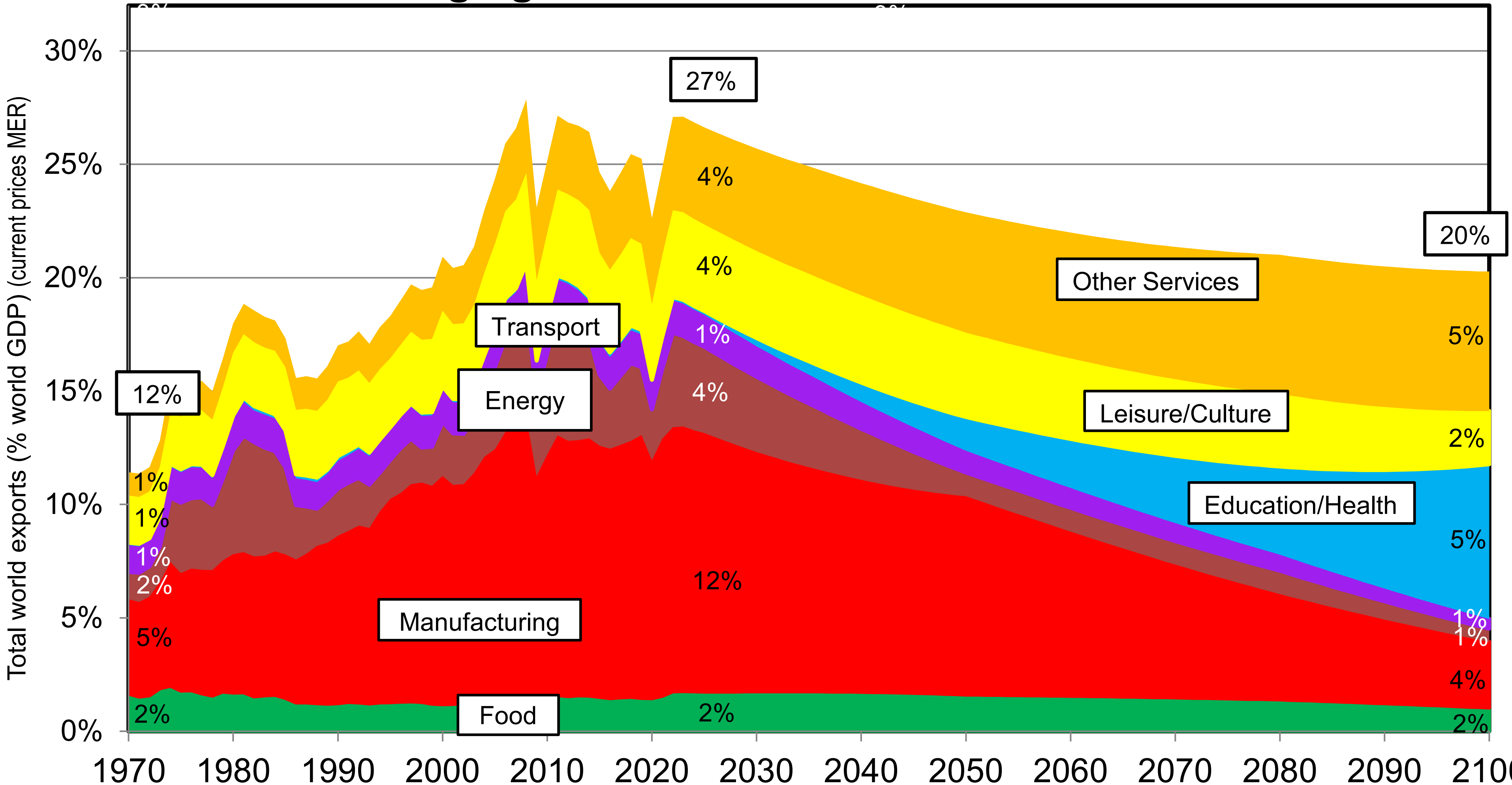

**Interpretation.** Material sectors like manufacturing, construction, food and energy have always been the most input-intensive (with input-output ratios around 60-70% in 2025), while immaterial sectors like education/health, leisure/culture and other services have always been much less input-intensive (with input-output ratios around 30-40% in 2025). In our benchmark simulations, we assume that each country converges by 2100 to the world average ratio observed in 2025 in each sector . **Sources and series**: wseed.world (O0i)

## Fig. 27. The Evolution of Input-Output Matrices: Output Share Used as Input by Other Sectors



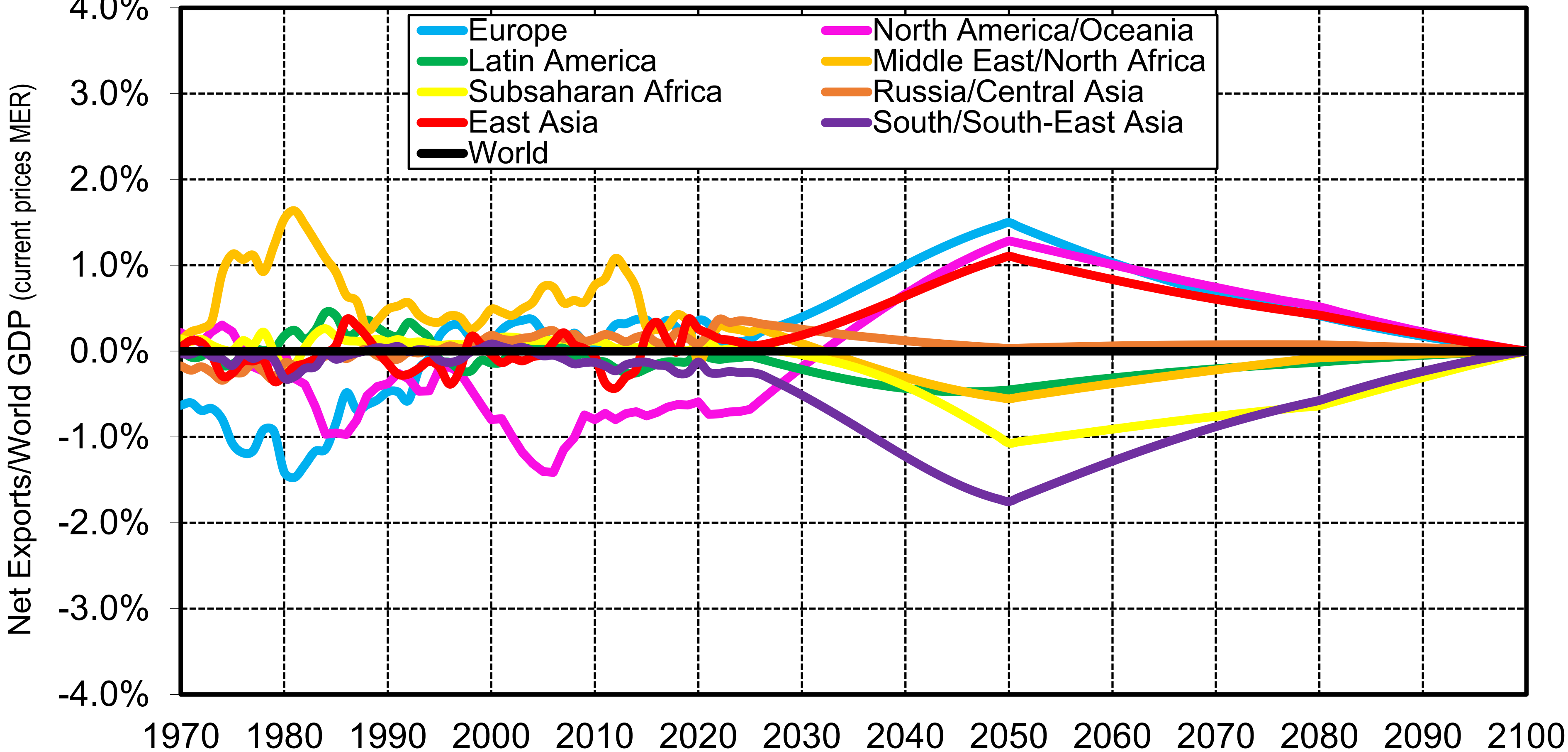

**Interpretation.** The share of each sector's output that is used as an intermediate input by other sectors (as opposed to the share that is used as final expenditure) has always been highest in energy (over 80% in 2025), followed by transport, other services and manufacturing (65-75%), food & leisure/culture (45-50%), construction & housing services (20-25%) and education/health (less than 10%). In our benchmark simulations, we assume that each country converges by 2100 to the average share observed in 2025 in each sector. **Sources and series**: wseed.world (O0s)

## Fig. 28. Sustainable Convergence Scenario: The Changing Structure of Global Trade Flows 1970-2100



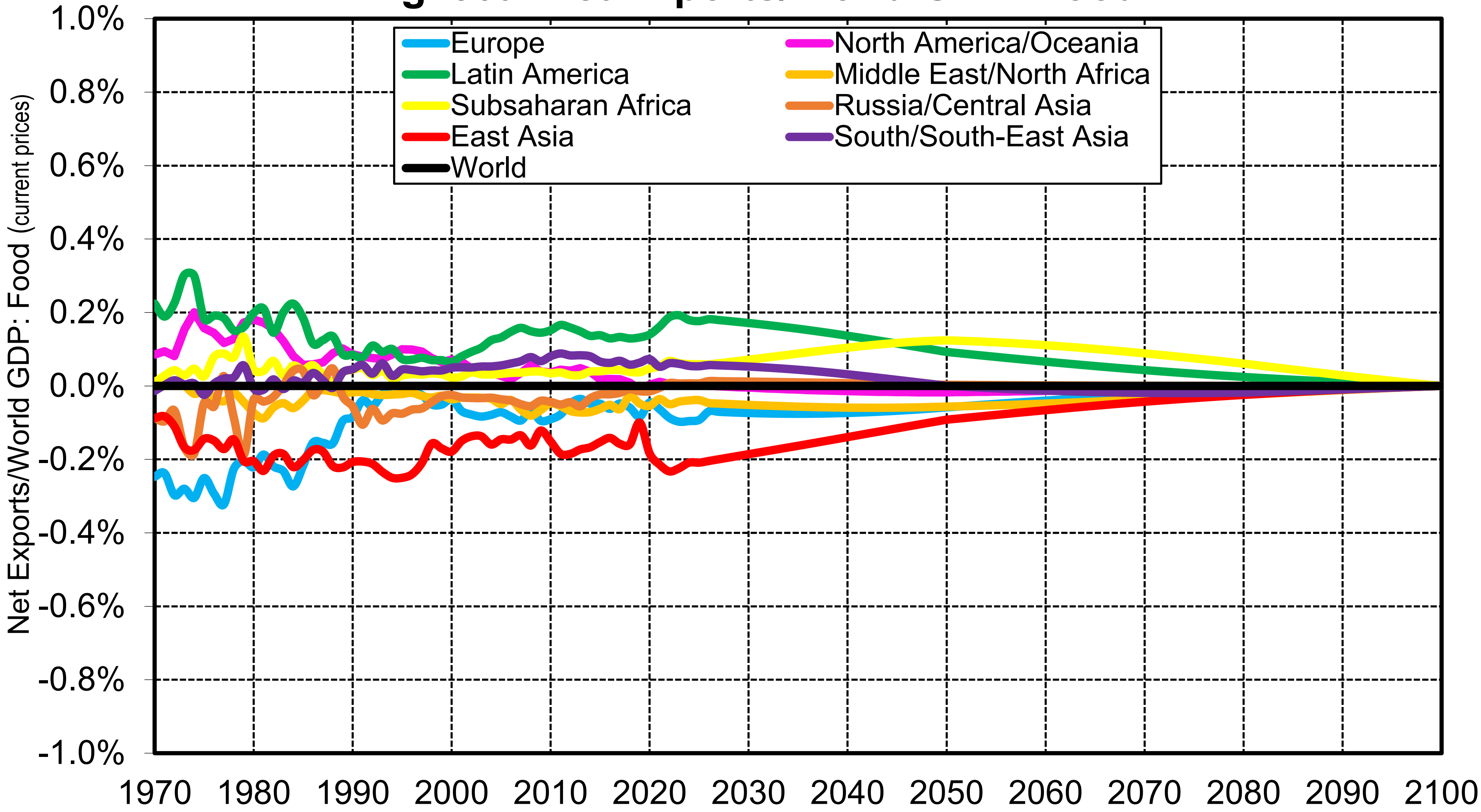

**Interpretation.** Total world exports rose from 12% of world GDP in 1970 to 20% in 2000 and 27% in 2008. They then stabilized around 26-27% between 2008 and 2025 and are projected to decline to 20% by 2100 according to the Sustainable Convergence scenario, with a sharp decline in material trade (mostly due to the fall in the share of material sectors in global GDP), partly compensated by the projected rise in immaterial trade. **Note.** Exports in housing/construction (less than 0.1% world GDP) are included in manufacturing. **Sources and series**: wseed.world (Q0)

## Fig. 29. Sustainable Convergence Scenario: The Changing Pattern of Trade Balance/World GDP

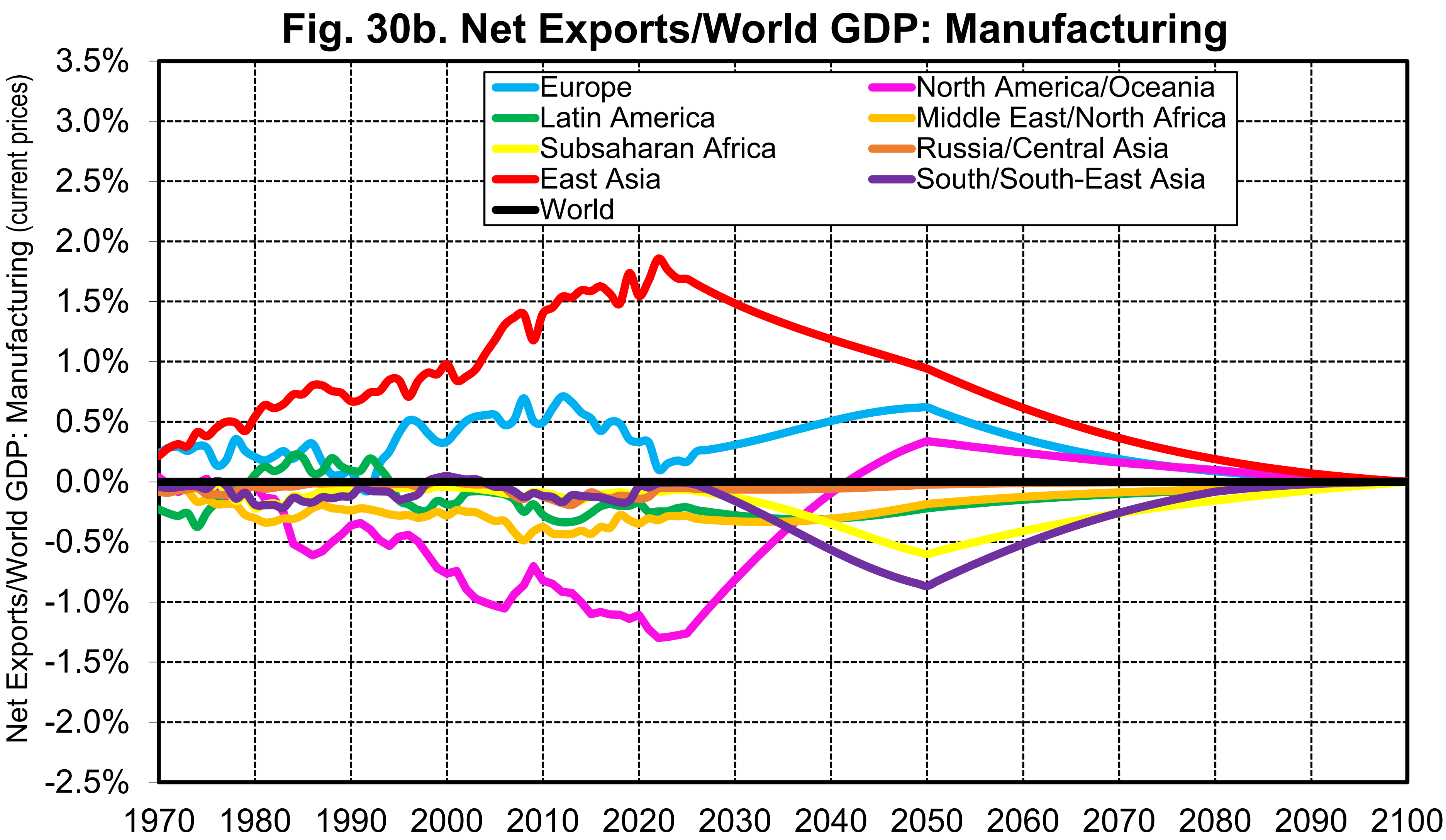



**Interpretation.** In the Sustainable Convergence scenario, all countries are projected to have balanced trade in all sectors by 2100. During the 2025-2100 transition period, we assume trade deficits in poor countries vis-a-vis rich countries, as a counterpart to large investment flows (manufacturing equipment, energy infrastructures, etc.) and human capital expenditure in poor countries. **Sources and series**: wseed.world (Q0nw)

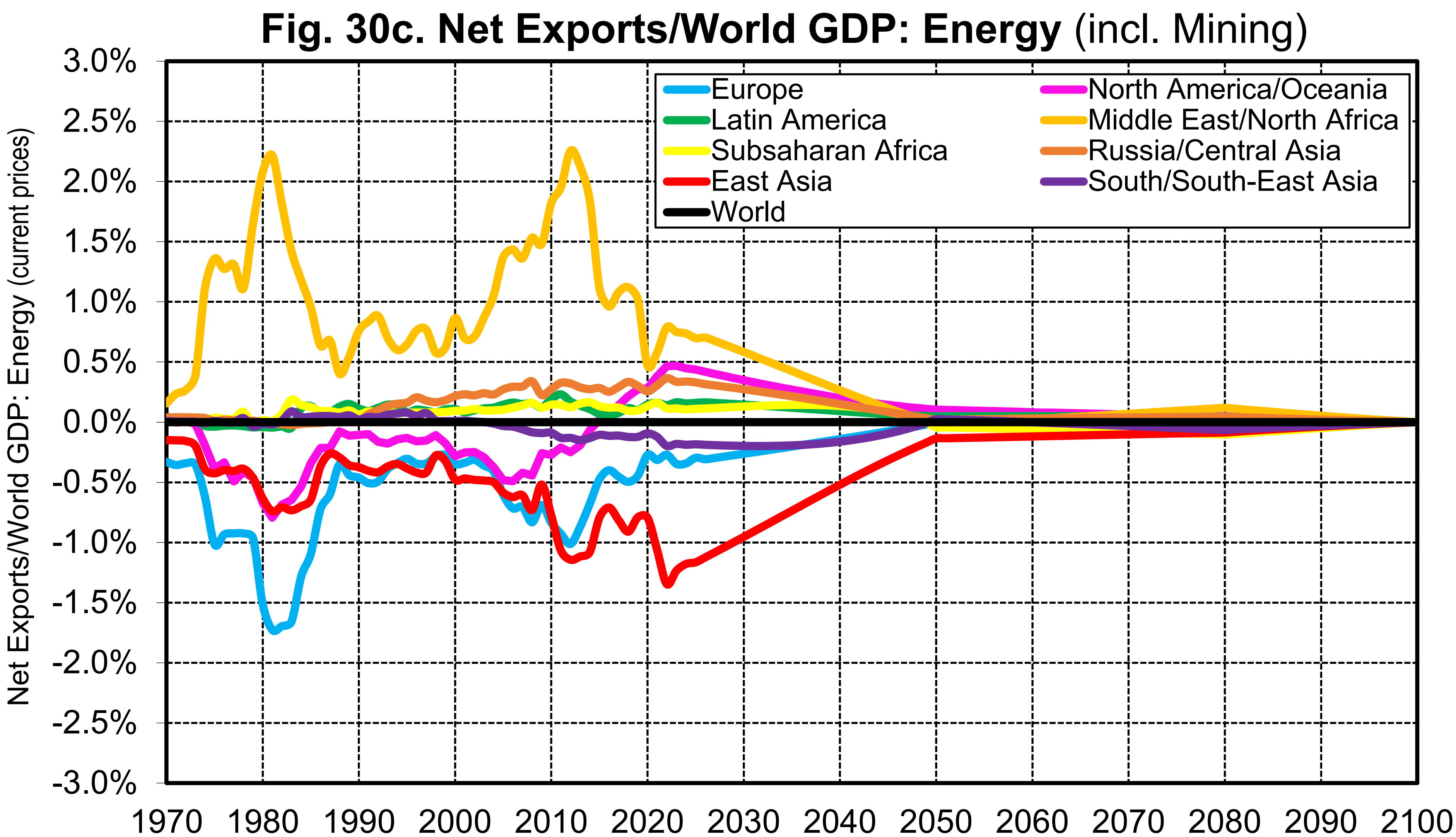
# Fig. 30a. Net Exports/World GDP: Food



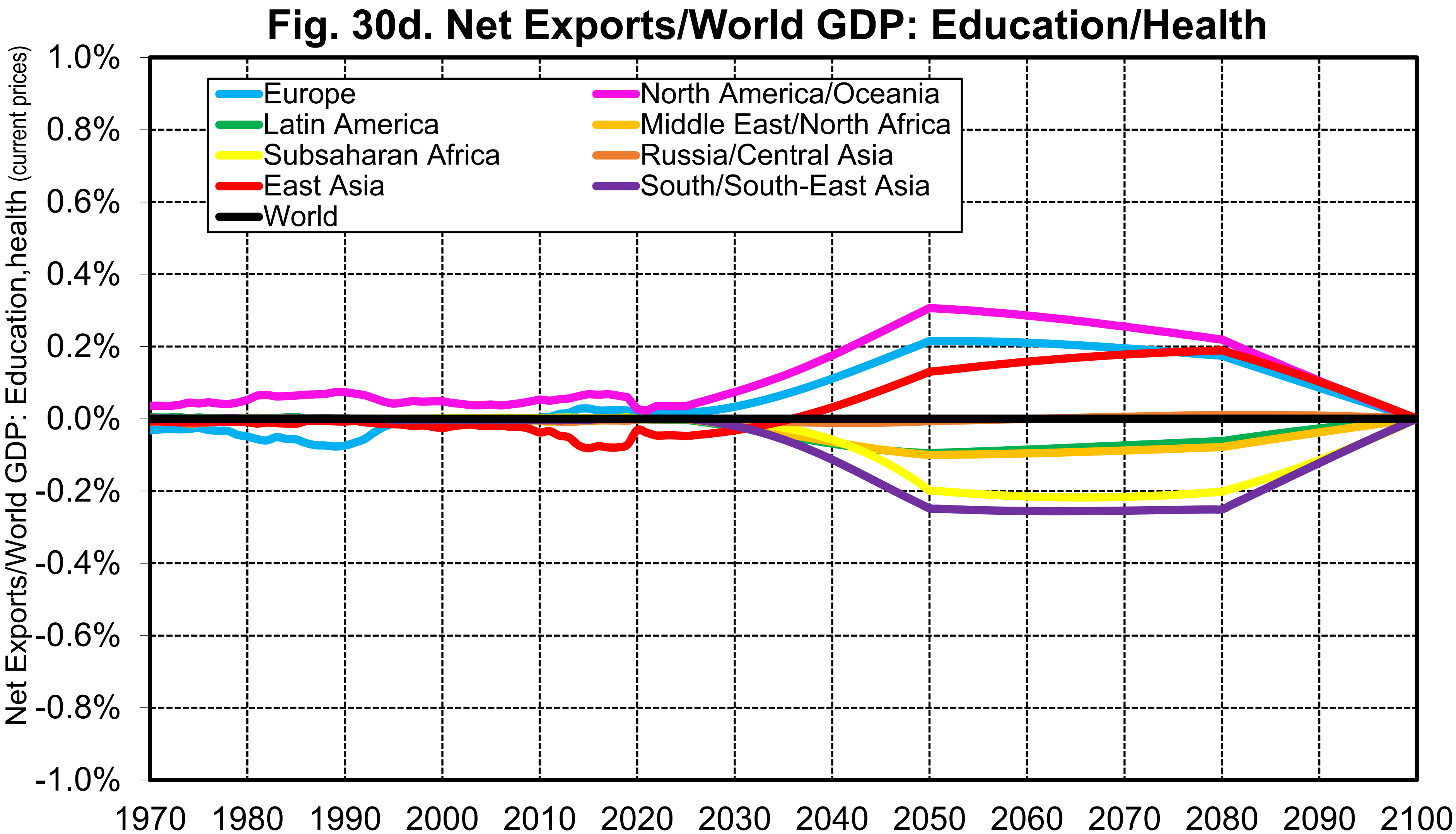

Observed series 1970-2025. Projected series 2025-2100 (benchmark scenario). **Sources and series**: wseed.world (Q1nw)



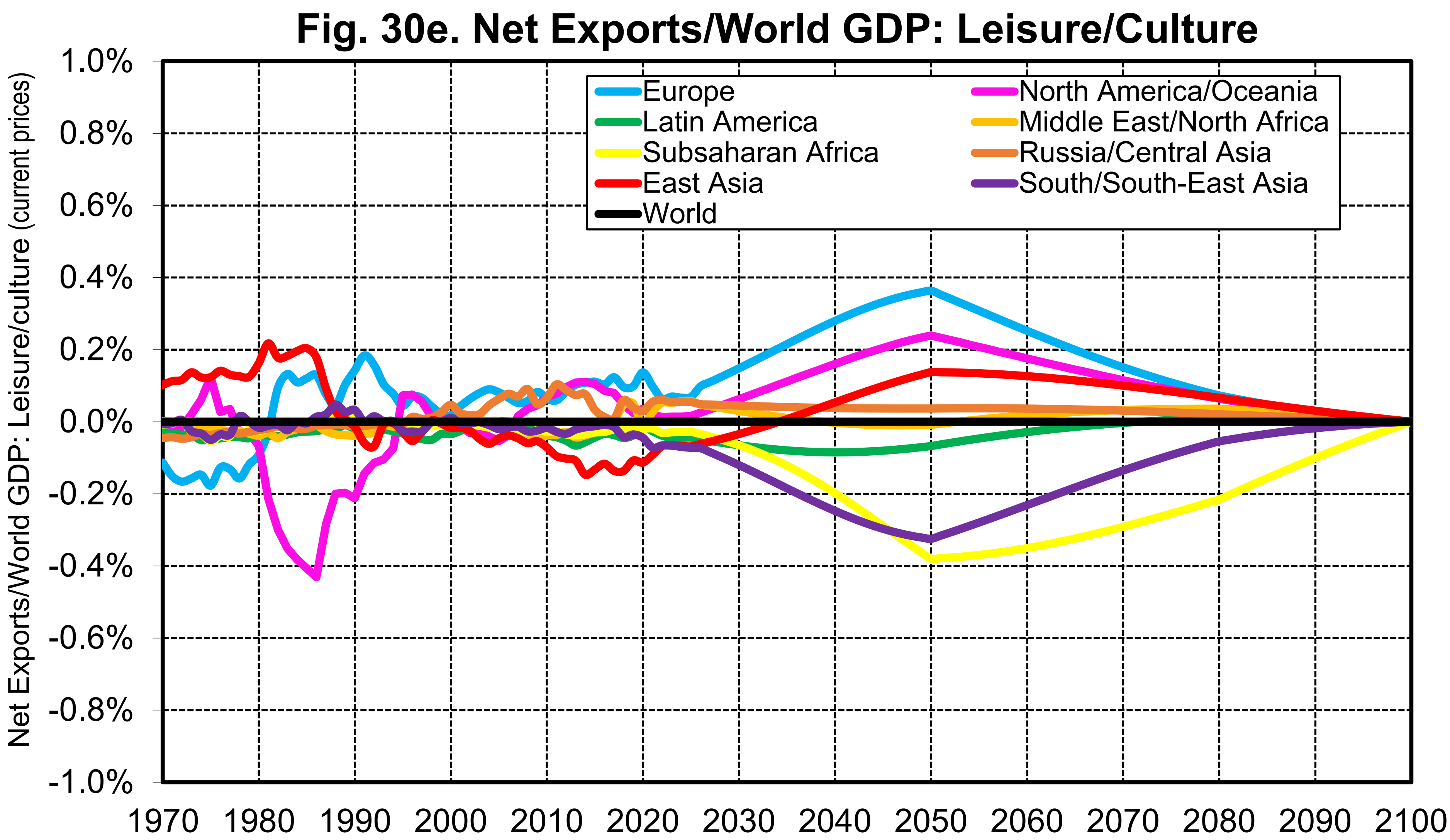

Observed series 1970-2025. Projected series 2025-2100 (benchmark scenario). **Sources and series**: wseed.world (Q3nw)



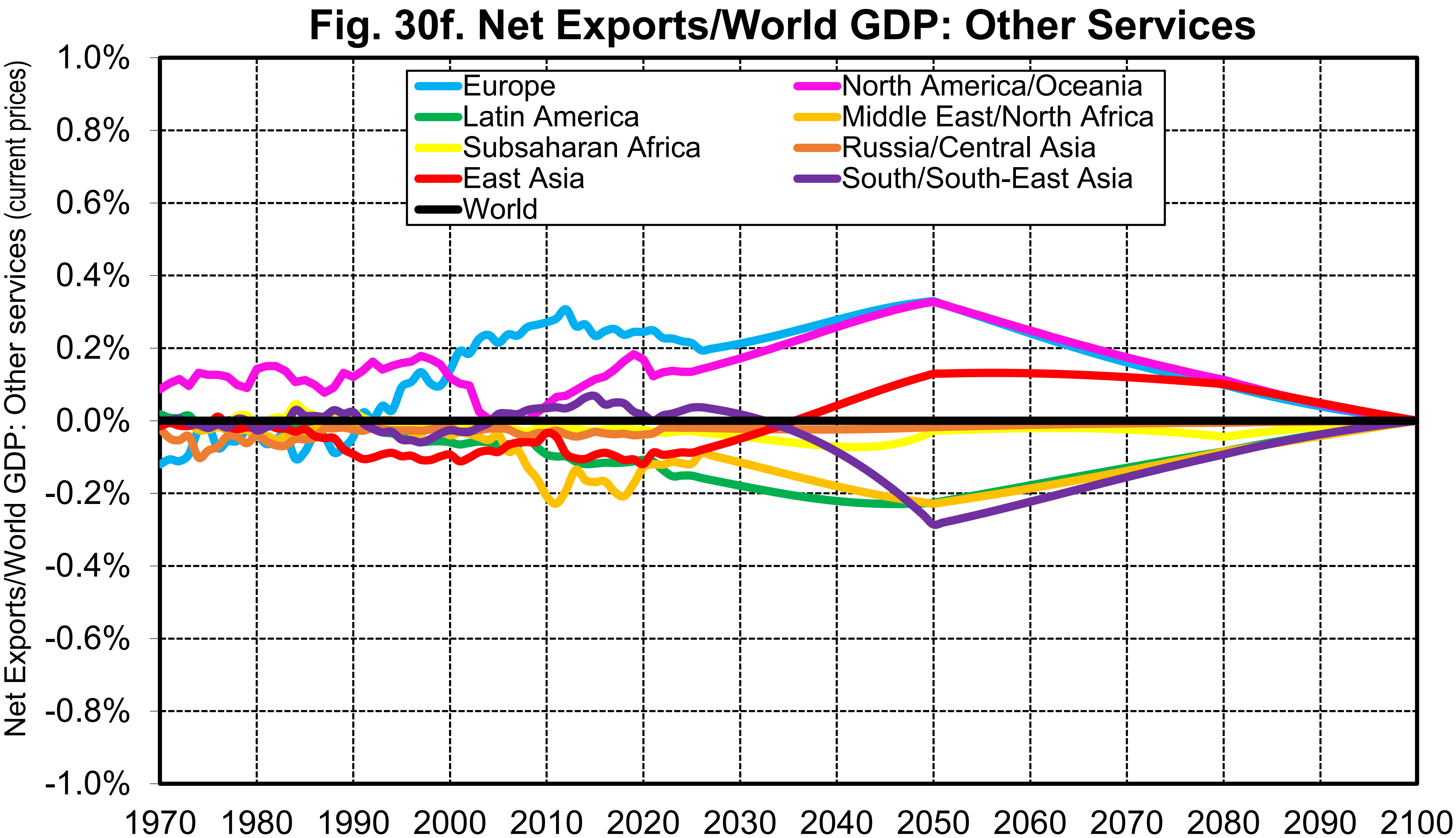

Observed series 1970-2025. Projected series 2025-2100 (benchmark scenario). **Sources and series**: wseed.world (Q4nw)




Observed series 1970-2025. Projected series 2025-2100 (benchmark scenario). **Sources and series**: wseed.world (Q5nw)




Observed series 1970-2025. Projected series 2025-2100 (benchmark scenario). **Sources and series**: wseed.world (Q6nw)



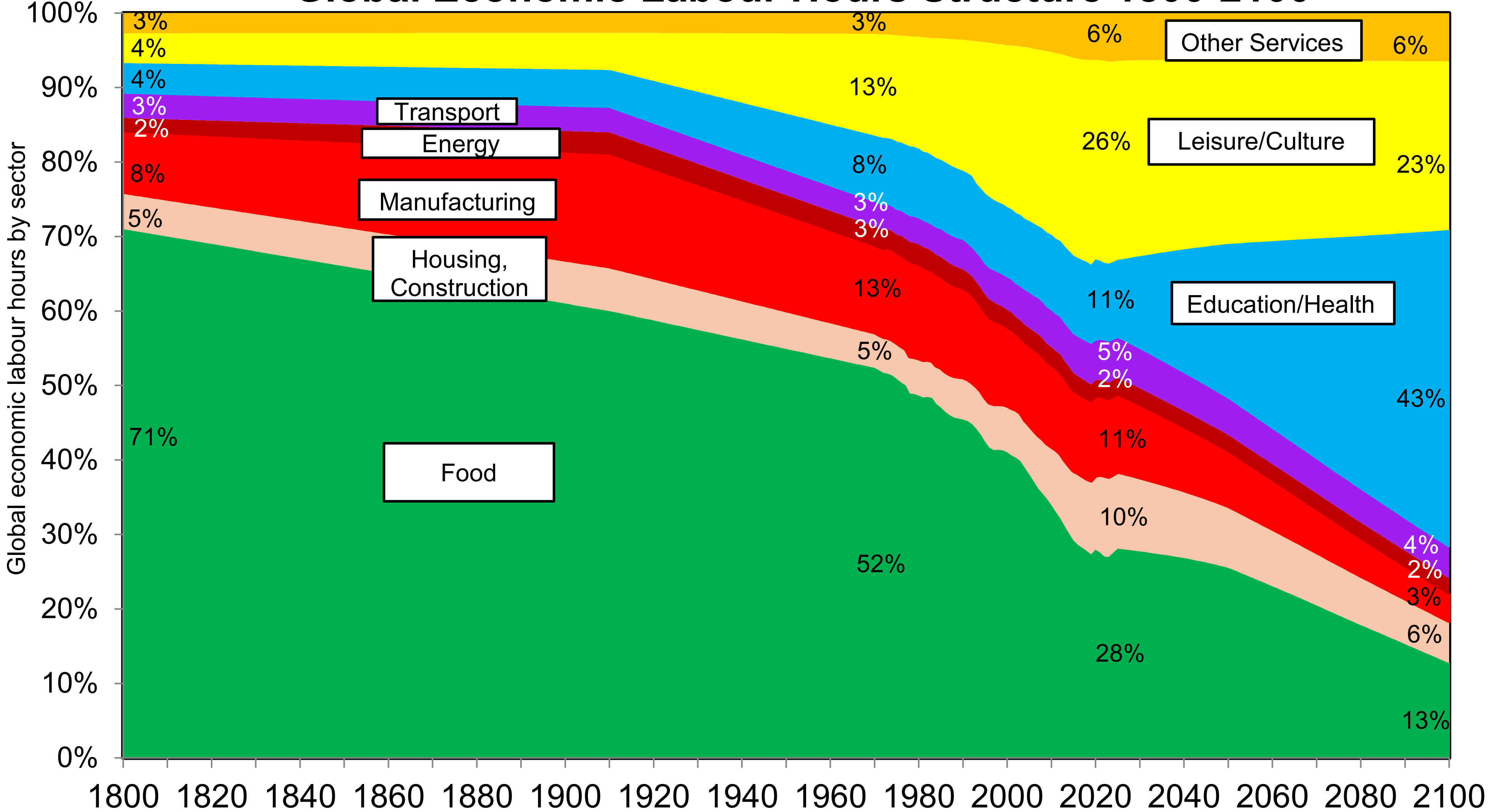

Observed series 1970-2025. Projected series 2025-2100 (benchmark scenario). **Sources and series**: wseed.world (Q8nw)

## Table 13. Sectoral Productivity Growth Rates, 1970-2200

| | | **Total Economy** | **Material sectors** | Food | Housing/ Construction | incl. Housing services | incl. Construction | Manufacturing Goods | Energy | Transport | **Immaterial sectors** | Education Health | Leisure Culture | Other Services |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annual productivity growth rate (PPP Euros 2025) | 1970-2025 | **1.5%** | **1.8%** | 2.0% | -0.2% | 1.8% | -0.9% | 2.1% | 0.7% | 1.0% | **0.8%** | 0.8% | 0.7% | 1.2% |
| | 2025-2100 | **2.5%** | **3.1%** | 3.3% | 2.5% | 2.5% | 2.5% | 3.4% | 2.7% | 2.9% | **2.0%** | 1.4% | 2.6% | 2.3% |
| | 2100-2200 | **0.8%** | **1.6%** | 1.5% | 1.3% | 1.3% | 1.3% | 1.7% | 1.3% | 1.7% | **0.7%** | 0.5% | 1.3% | 0.5% |

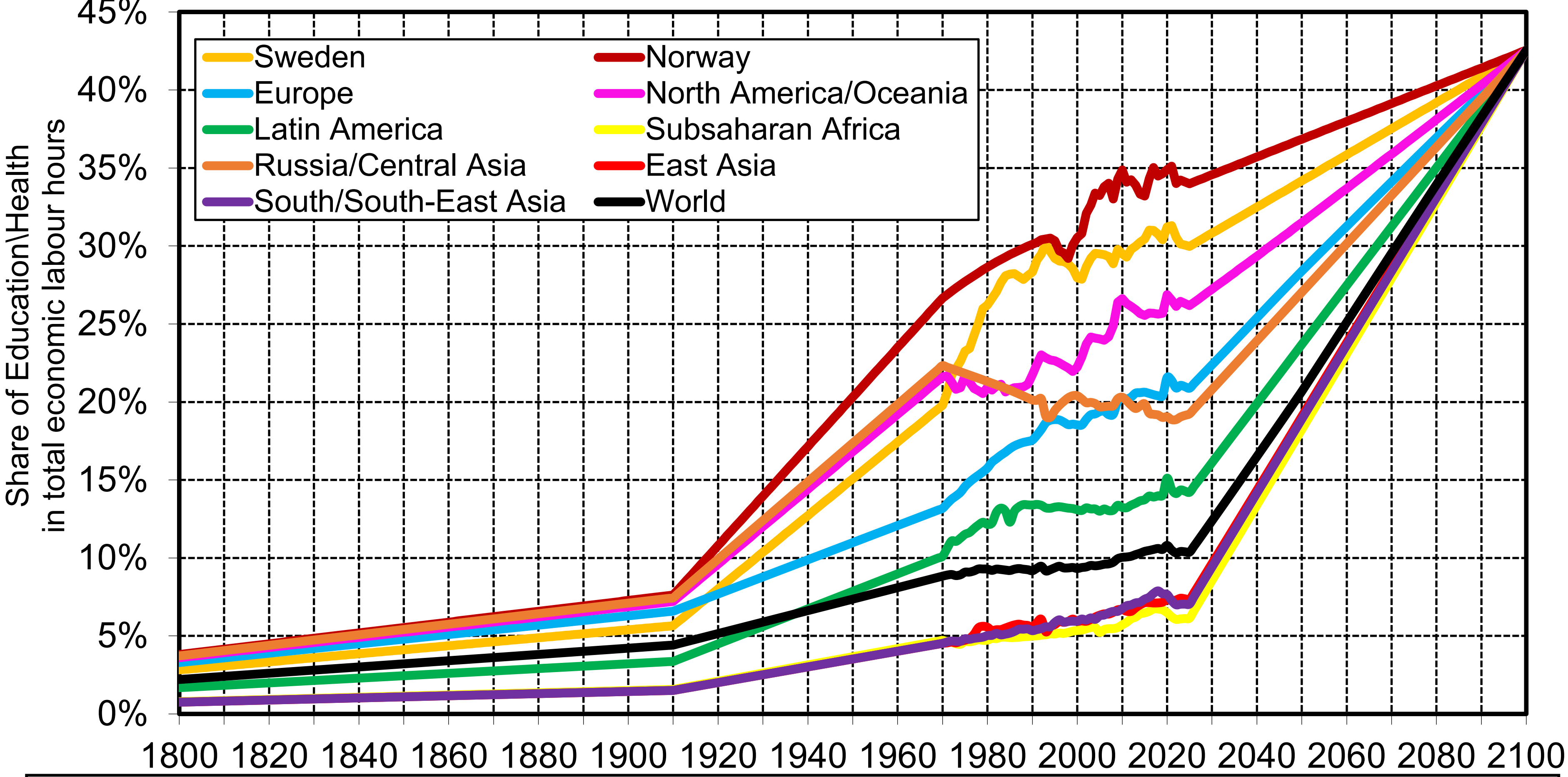
**Interpretation.** The growth rate of productivity (hourly GDP) has generally been higher in material sectors than in immaterial sectors in the past (with an average gap around 1% per year over the 1970-2025), and we assume similar differentials for the future. **Source:** wseed.world (F1b)

# Fig. 31. Planetary Habitability & Structural Transformation: Global Economic Labour Hours Structure 1800-2100



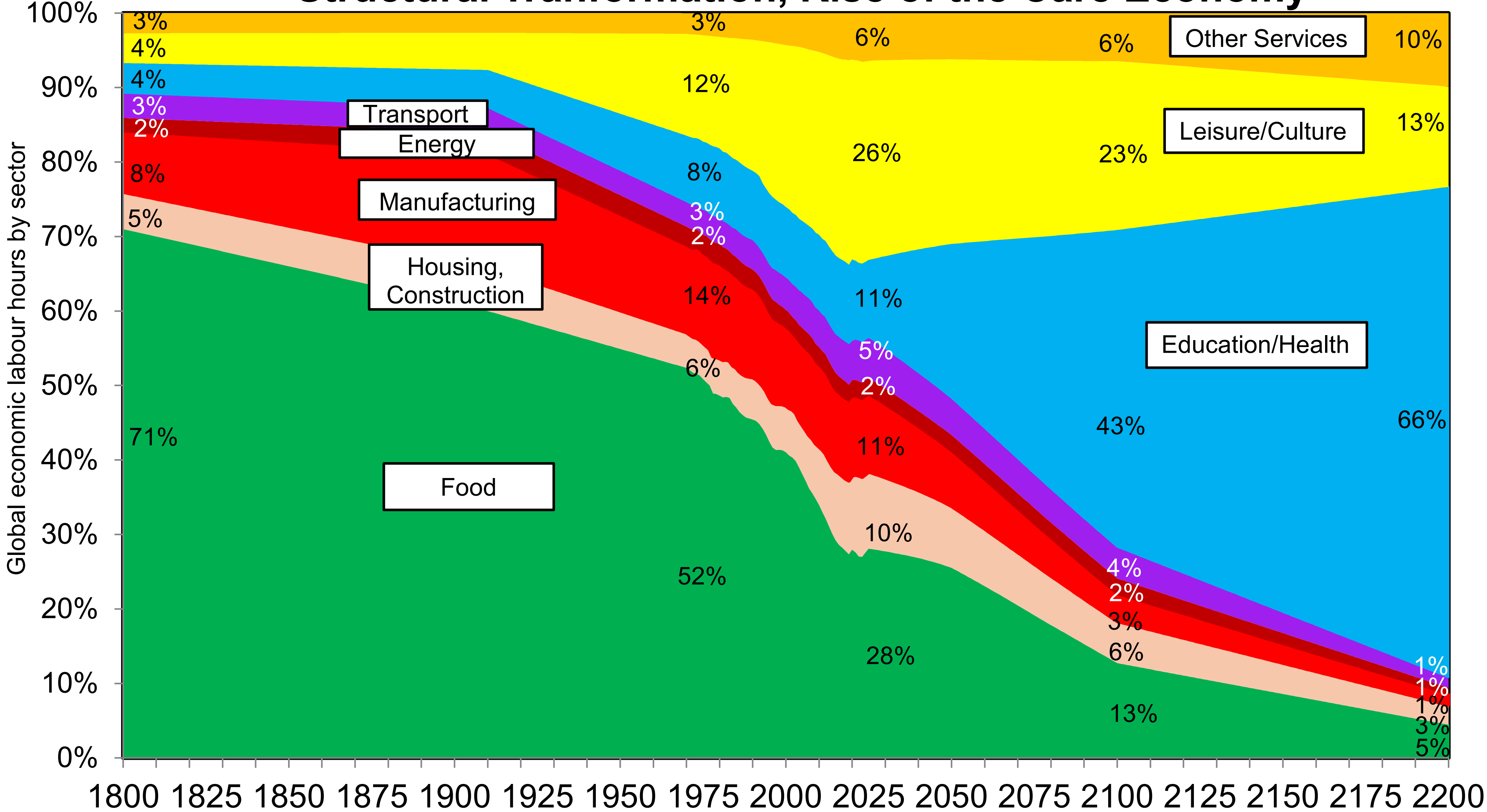

**Interpretation.** At the world level, the share of food production in total economic labour hours dropped from 71% in 1800 to 52% in 1970 and 28% in 2025, and is scheduled to drop to about 13% by 2100 in our benchmark scenario. **Sources and series** : wseed.world (E1l)

# Fig. 32. The Ongoing Rise of Education, Health & Public Services



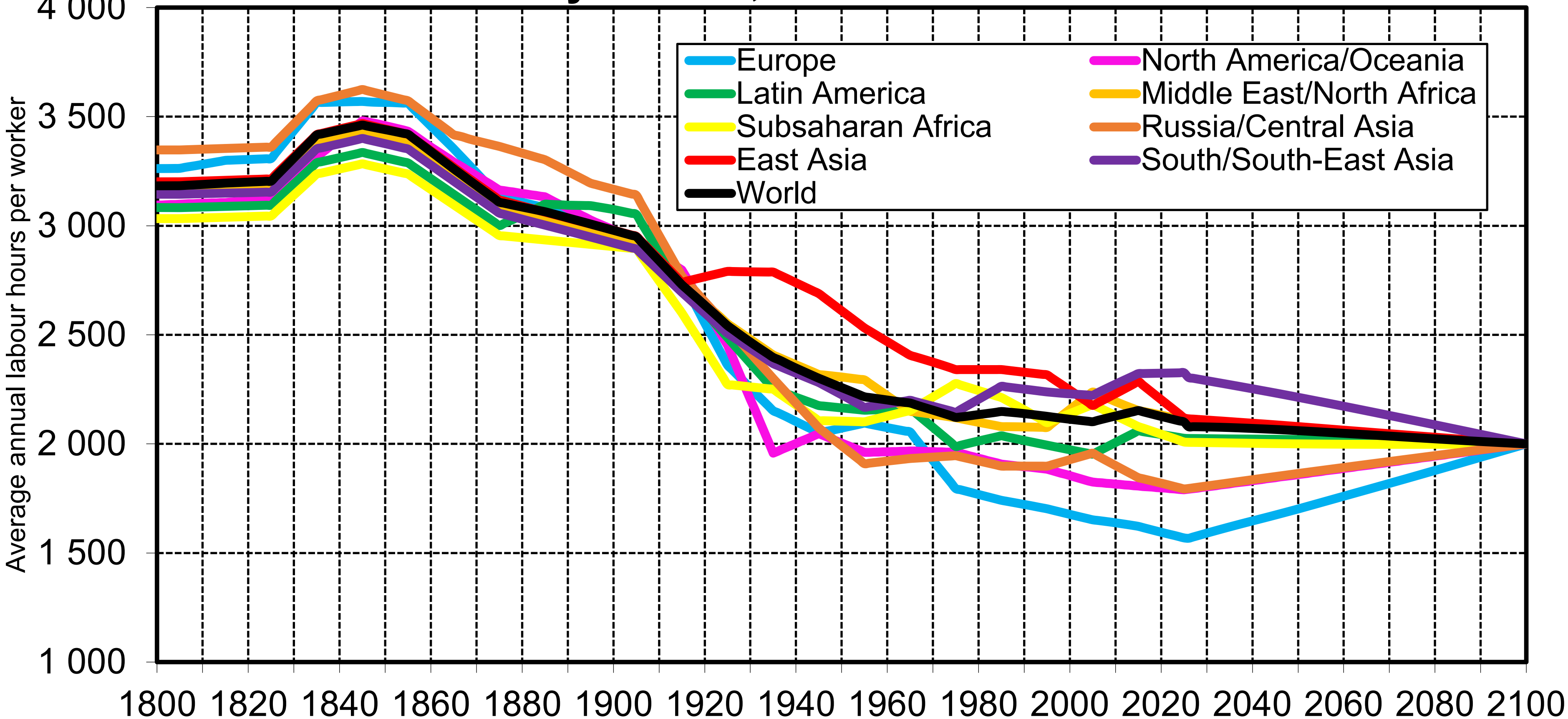

**Interpretation**. At the world level, the share of education, health and public services in total economic labour hours rose from 2% in 1800 to 8% in 1970, 11% in 2025 and is scheduled to rise to 43% by 2100 under the Sustainable Convergence scenario. In 2025, it is already around 30-35% of total economic labour hours in Sweden and Norway. **Sources and series**: wseed.world (E1m)

# Fig. 33. Post-2100 Development Path: Continuation of Structural Tranformation, Rise of the Care Economy



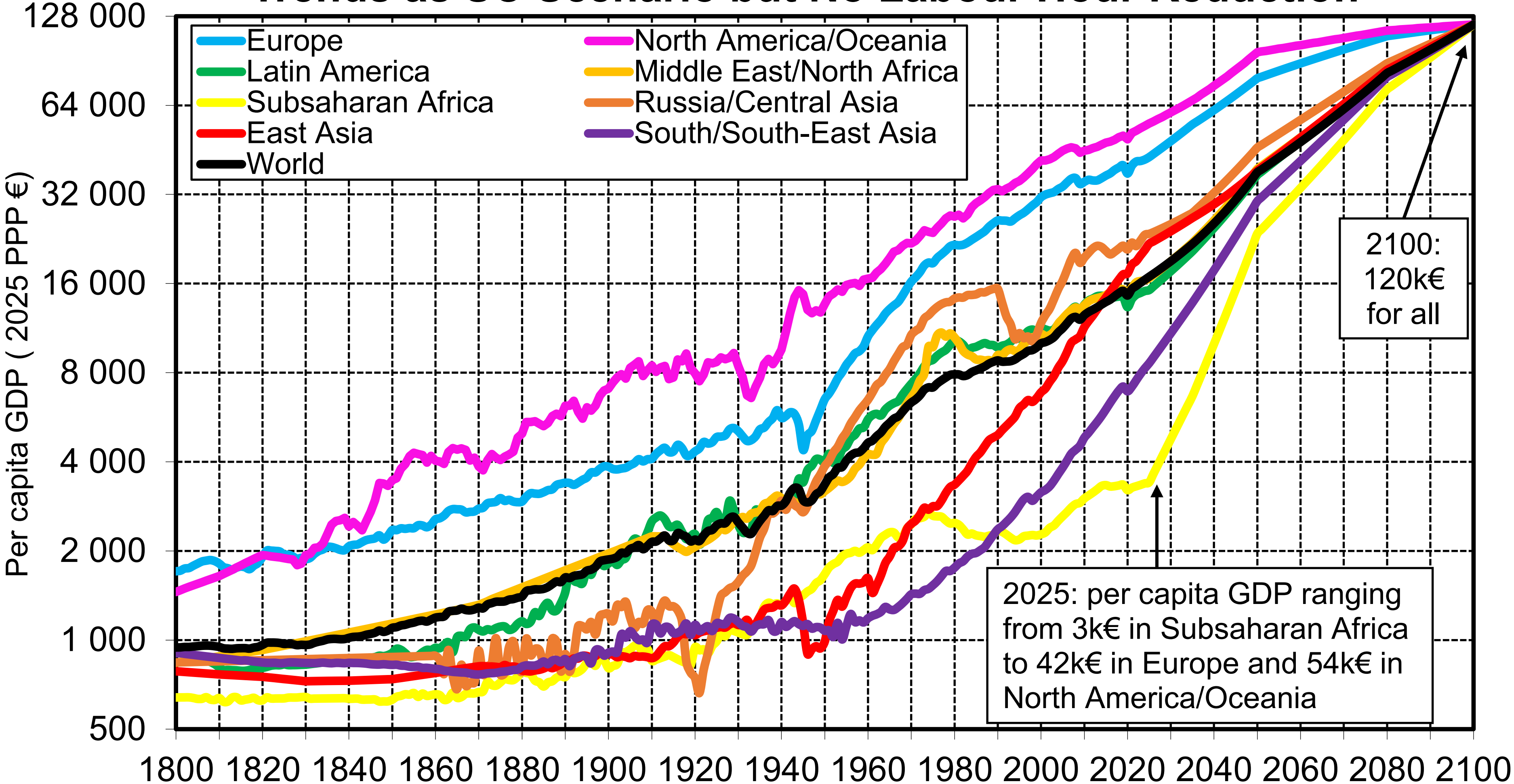

**Interpretation.** Because they are characterized by slower technical change than other sectors, care economy sectors (education, health) are projected to absorb a rising fraction of labour hours in the future. **Sources and series** : wseed.world (E1n)

# Fig. 34. Productivist Convergence Scenario 2025-2100: Same Productivity Trends, but No Labour Hour Reduction



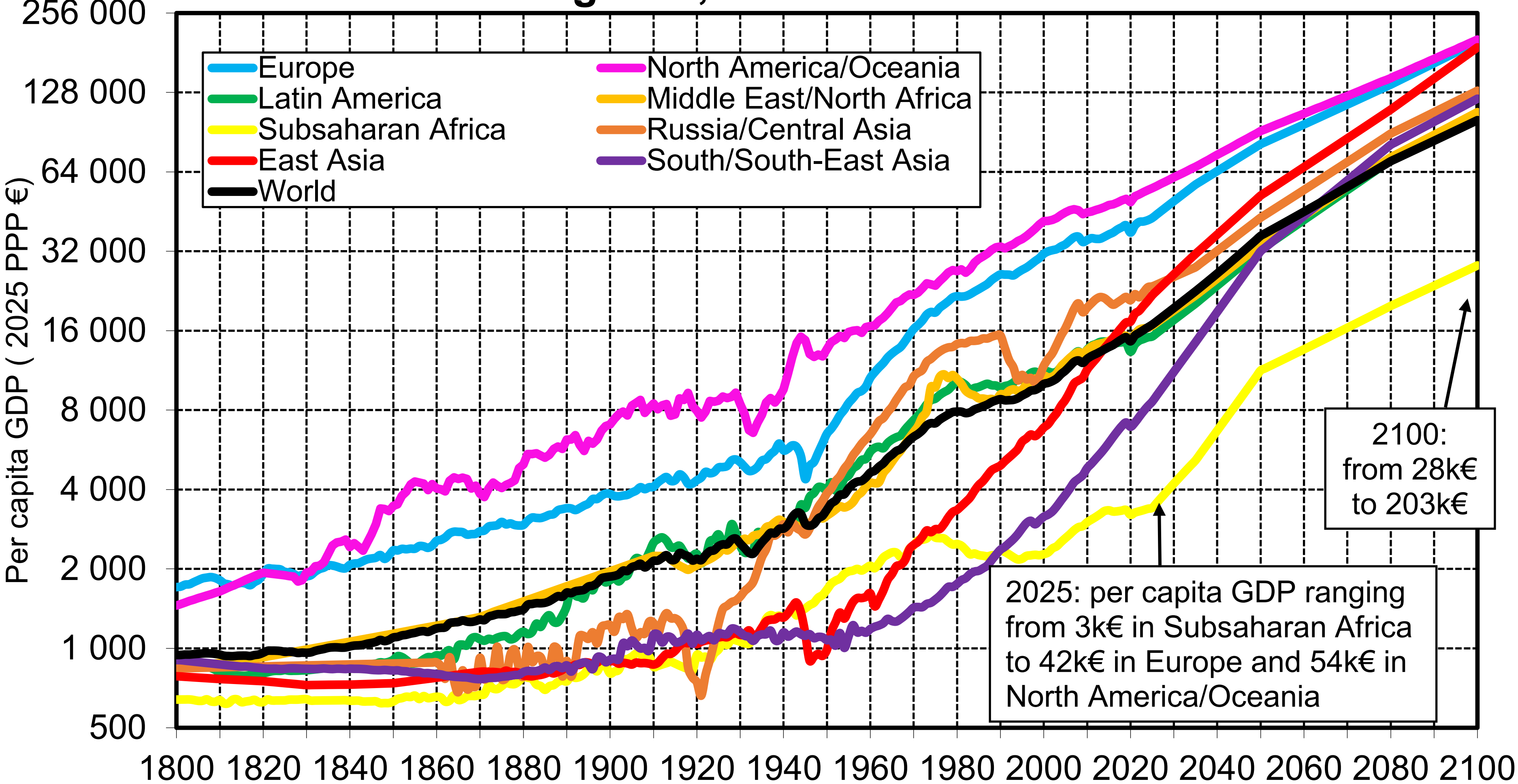

**Interpretation**. According to the Productivist Convergence scenario, productivity growth follows the same trend over the 2025-2100 period as in the Sustainable Convergence scenario (with hourly productivity equal to 125 Euros PPP 2025 in all countries by 2100), but without any major reduction of labour hours. I.e. annual labour hours per worker are assumed to converge in all countries toward 2000 hours over the 2025-2100 period (as compared to a world average equal to 2100 hours in 2025). **Sources and series**: wseed.world (E1i)

# Fig. 35. Productivist Convergence: Same Productivity Trends as SC Scenario but No Labour Hour Reduction

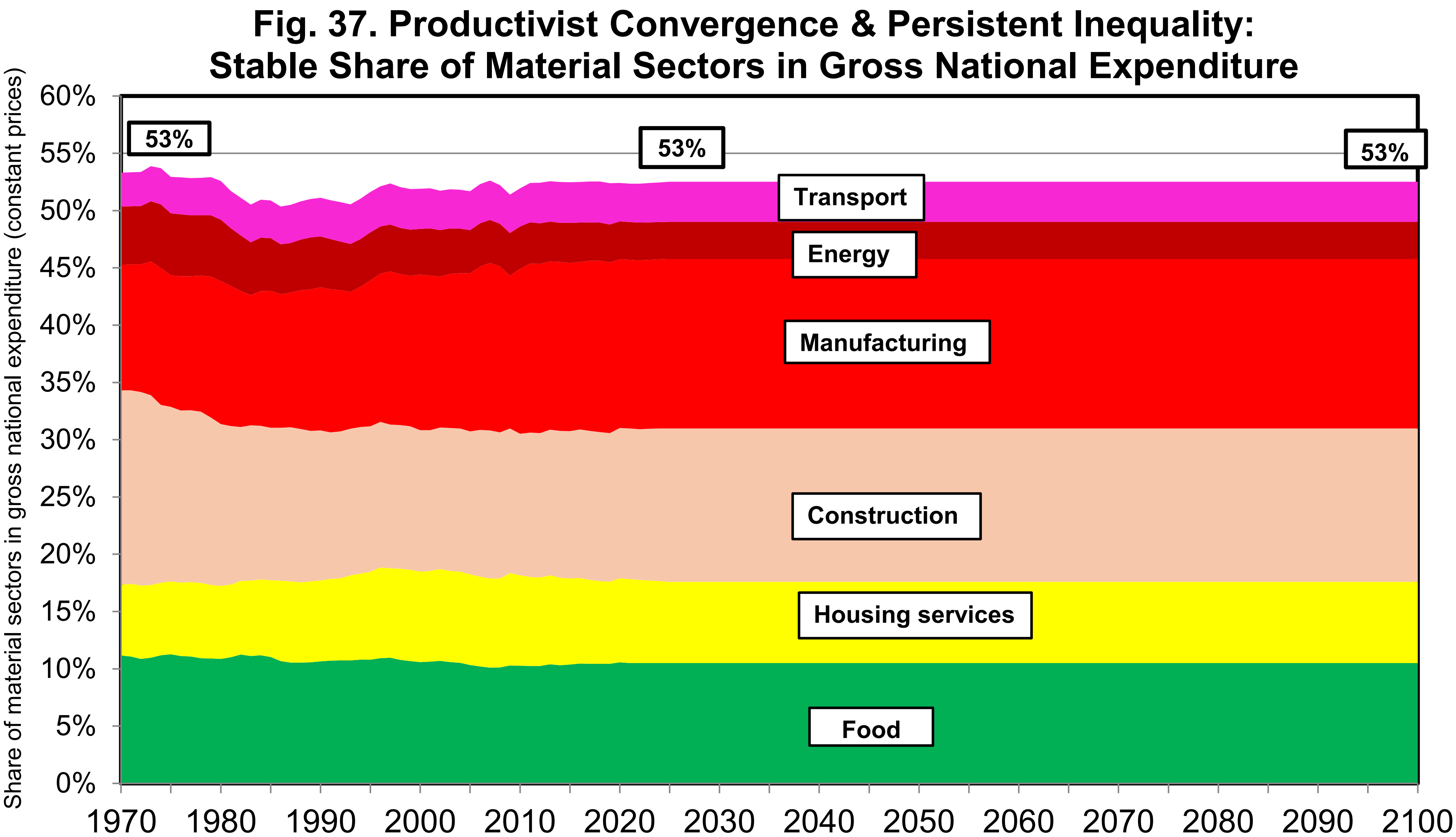



**Interpretation**. In the "productivist convergence" scenario, we assume the same productivity trends as in "sustainable convergence" but with no reduction in labour hours, resulting in much larger per capita GDP levels (120k€ rather than 60k€). **Sources and series**: wseed.world (A1d)

## Fig. 36. Persistent Inequality Scenario: Partial Productivity Convergence, No Labour Hour Reduction




**Interpretation**. In the "persistent inequality" scenario, we assume partial convergence in productivity levels (following patterns observed over the 1990-2025 period) and no reduction in labour hours, resulting in persistent inequality in per capita GDP. **Sources and series**: wseed.world (A1e)




**Interpretation**. The share of material sectors in gross national expenditure (final consumption and investement) remained stable at 53% at the world level between 1970 and 2025. It is a projected to remain stable around 53% between 2025 and 2100 according to our productivist convergence and persistent inequality scenarios. **Sources and series**: wseed.world (G0p)

**Table 14. Per Capita GDP Growth Rates, 1950-2100 : Comparing Sustainable Convergence (SC), Productivist Convergence (PC) and Persistent Inequality (PI) Scenarios**

| Annual growth rates of per capita GDP (2025 PPP Euros) | | World | Europe | North America/ Oceania | Latin America | Middle East/North Africa | Subsaharan Africa | Russia/ Central Asia | East Asia | South & South-East Asia |
|---|---|---|---|---|---|---|---|---|---|---|
| 1950-1990 | | **2.4%** | 3.5% | 2.3% | 2.3% | 2.7% | 0.9% | 3.5% | **4.1%** | 2.0% |
| 1990-2025 | | **1.9%** | 1.4% | 1.5% | 1.3% | 1.7% | 1.1% | 1.2% | **4.3%** | 3.8% |
| 2025-2100 | Sustainable Convergence | **1.7%** | 0.5% | 0.1% | 1.8% | 1.7% | **3.9%** | 1.3% | 1.4% | 2.6% |
| | Productivist Convergence | **2.7%** | 1.4% | 1.0% | 2.8% | 2.7% | 4.9% | 2.2% | 2.3% | 3.6% |
| | Persistent Inequality | **2.4%** | 2.1% | 1.7% | 2.6% | 2.5% | 2.9% | 2.3% | 2.9% | 3.6% |

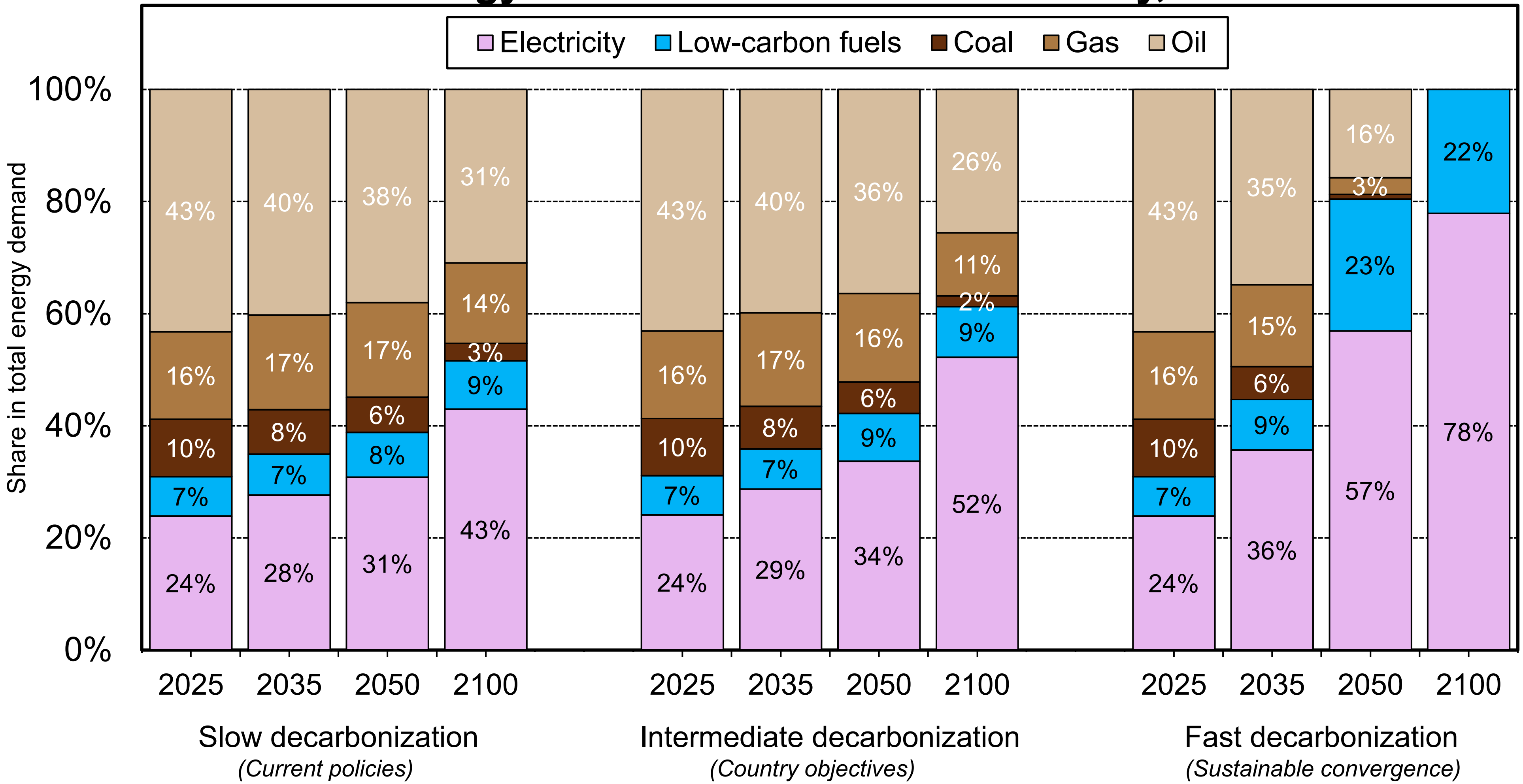
**Interpretation.** Projected per capital GDP growth rates for Subsaharan Africa over the 2025-2100 period under the Sustainable Convergence scenario are high (close to 4% per year on average), but not higher than those observed in East Asia over the 1950-2025 period. **Source:** wseed.world (A1b)

### Table 15. Comparison between per capita GDP Projections of our Three Scenarios versus SSP-IPCC scenarios

| | World Region | Sustainable Convergence (SC) | Productivist Convergence (PC) | Persistent Inequality (PI) | SSP1 *("Sustainability")* | SSP2 *("Middle of the road")* | SSP3 *("Regional rivalry")* | SSP4 *("Inequality")* | SSP5 *("Fossil-fueled development")* |
|---|---|---|---|---|---|---|---|---|---|
| Per-Capita GDP, Growth Rate 2025 - 2100 (%) | East Asia | 1.4% | 2.3% | 2.9% | 1.2% | 1.1% | 0.6% | 1.0% | 1.6% |
| | Europe | 0.5% | 1.4% | 2.1% | 1.3% | 1.2% | 0.3% | 1.1% | 1.9% |
| | Latin America | 1.8% | 2.8% | 2.6% | 2.3% | 2.1% | 0.9% | 2.0% | 2.9% |
| | MENA | 1.7% | 2.7% | 2.5% | 1.7% | 1.5% | 0.6% | 1.4% | 2.4% |
| | North America & Oceania | 0.1% | 1.0% | 1.7% | 2.2% | 2.0% | 0.8% | 1.8% | 2.9% |
| | Russia & Central Asia | 1.3% | 2.2% | 2.3% | 2.2% | 2.0% | 0.9% | 1.9% | 2.8% |
| | South & Southeast Asia | 2.6% | 3.6% | 3.6% | 2.0% | 1.8% | 0.8% | 1.5% | 2.6% |
| | Sub-Saharan Africa | 3.9% | 4.9% | 2.9% | 3.1% | 2.7% | 1.4% | 2.1% | 3.8% |
| | **World** | **1.7%** | **2.7%** | **2.4%** | **2.1%** | **1.7%** | **0.6%** | **1.3%** | **2.7%** |
| Per-Capita GDP in 2100 as ratio of World Per-Capita GDP in 2100 | East Asia | 100 | 100 | 189 | 113 | 129 | 158 | 183 | 110 |
| | Europe | 100 | 100 | 198 | 151 | 169 | 218 | 244 | 144 |
| | Latin America | 100 | 100 | 104 | 117 | 128 | 129 | 182 | 117 |
| | MENA | 100 | 100 | 107 | 129 | 134 | 138 | 140 | 128 |
| | North America & Oceania | 100 | 100 | 202 | 170 | 186 | 290 | 269 | 161 |
| | Russia & Central Asia | 100 | 100 | 129 | 123 | 131 | 148 | 163 | 123 |
| | South & Southeast Asia | 100 | 100 | 121 | 94 | 97 | 90 | 92 | 93 |
| | Sub-Saharan Africa | 100 | 100 | 28 | 59 | 52 | 37 | 35 | 61 |
| | **World** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |

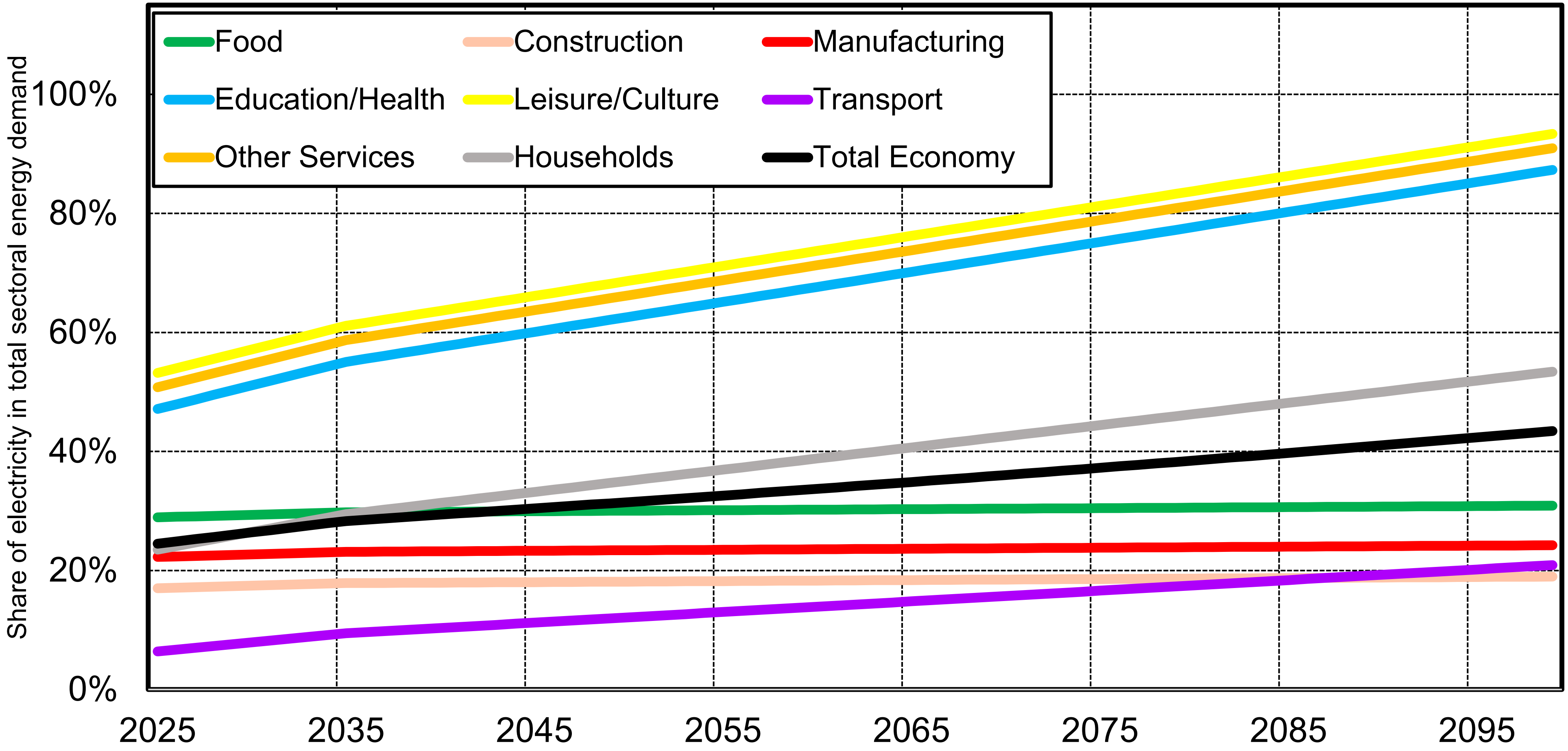
**Interpretation.** The projected growth rates for world per capita GDP over the 2025-2100 period according to our three scenarios generally fall in the same range as those considered in the SSP scenarios (Shared Socioeconomic Pathways) used in IPCC Reports. The main difference is that SSP scenarios do not consider the possibility of complete convergence: in 2100, the income gap between the poorest and richest regions is around 1 to 3 or more (including in SSP1 and 2). **Sources**: wseed.world (X3b)

# Fig. 38. Slow, Intermediate, and Fast Decarbonization: Total Energy Demand of the World Economy, 2025-2100



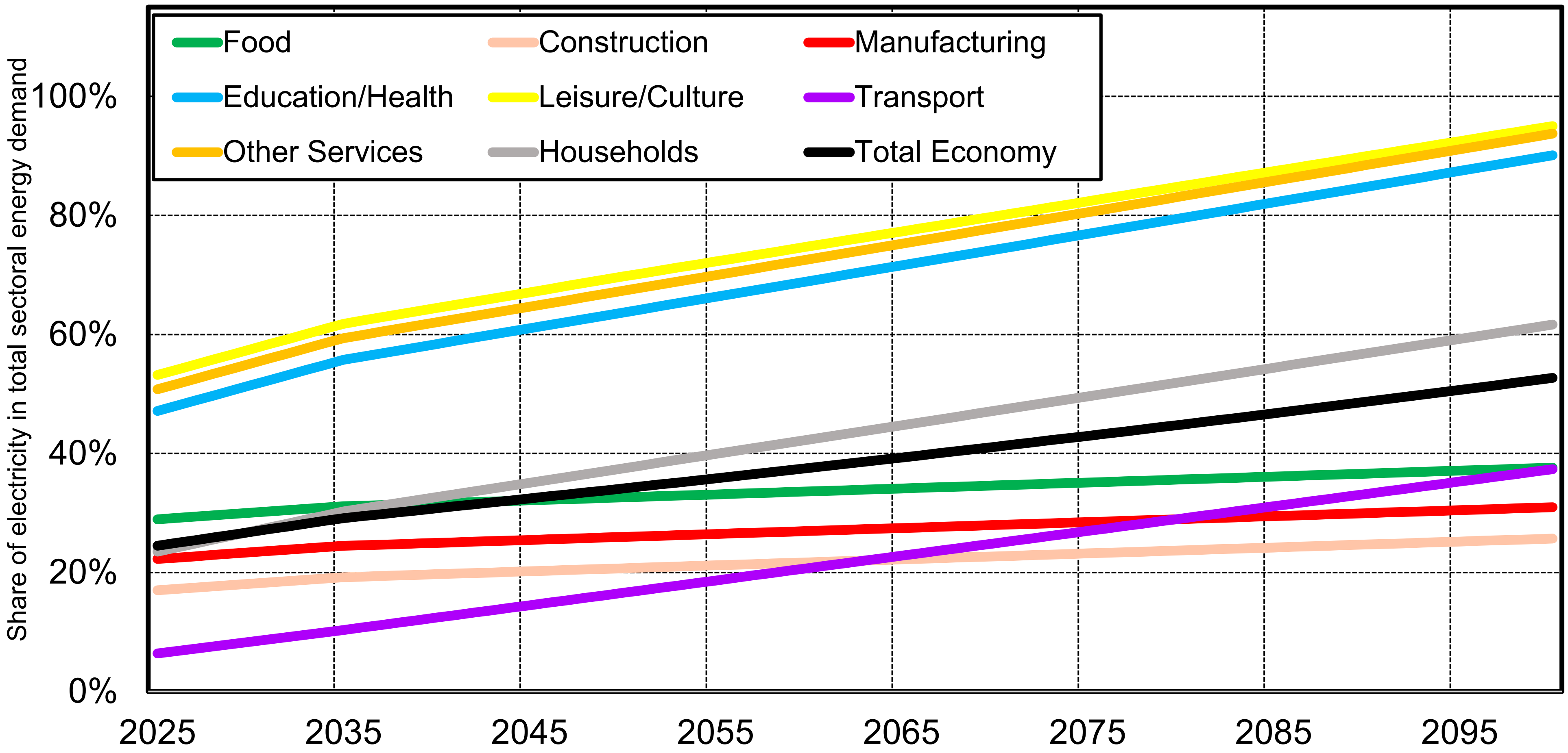

**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels (less than 20% of total energy demand of the world economy by 2050 and 0% by 2100) as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives). **Note.** "Electricity" includes district heat production (from CHP plants, heat pumps, and electric boilers), which accounts for 4% of total final energy demand in 2025, compared to 20% for electricity strictly speaking. **Sources and series**: wseed.world (T1)

## Fig. 39a. Share of Electrification in Total Energy Demand, Slow Decarbonization Scenario, 2025-2100



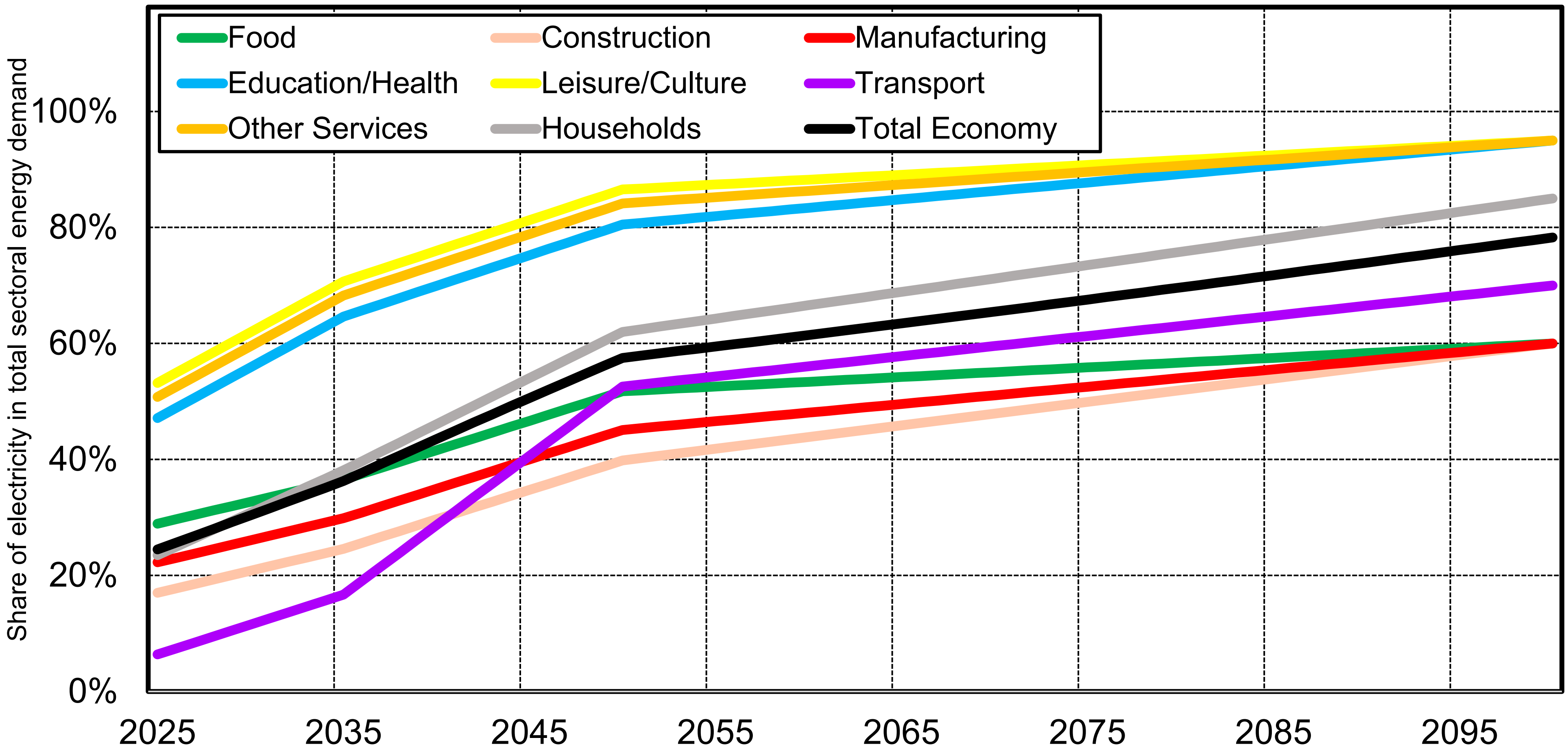

**Interpretation**. According to the Slow Decarbonization scenario (current policies), the share of electricity in total energy demand is scheduled to rise from 24% in 2025 to 43% in 2100, with large variations across sectors. **Note.** The energy demand of the household sector corresponds to direct energy consumption by households, primarily for residential heating and personal vehicle use. **Sources and series**: wseed.world (T2a)

## Fig. 39b. Share of Electrification in Total Energy Demand, Intermediate Decarbonization Scenario, 2025-2100



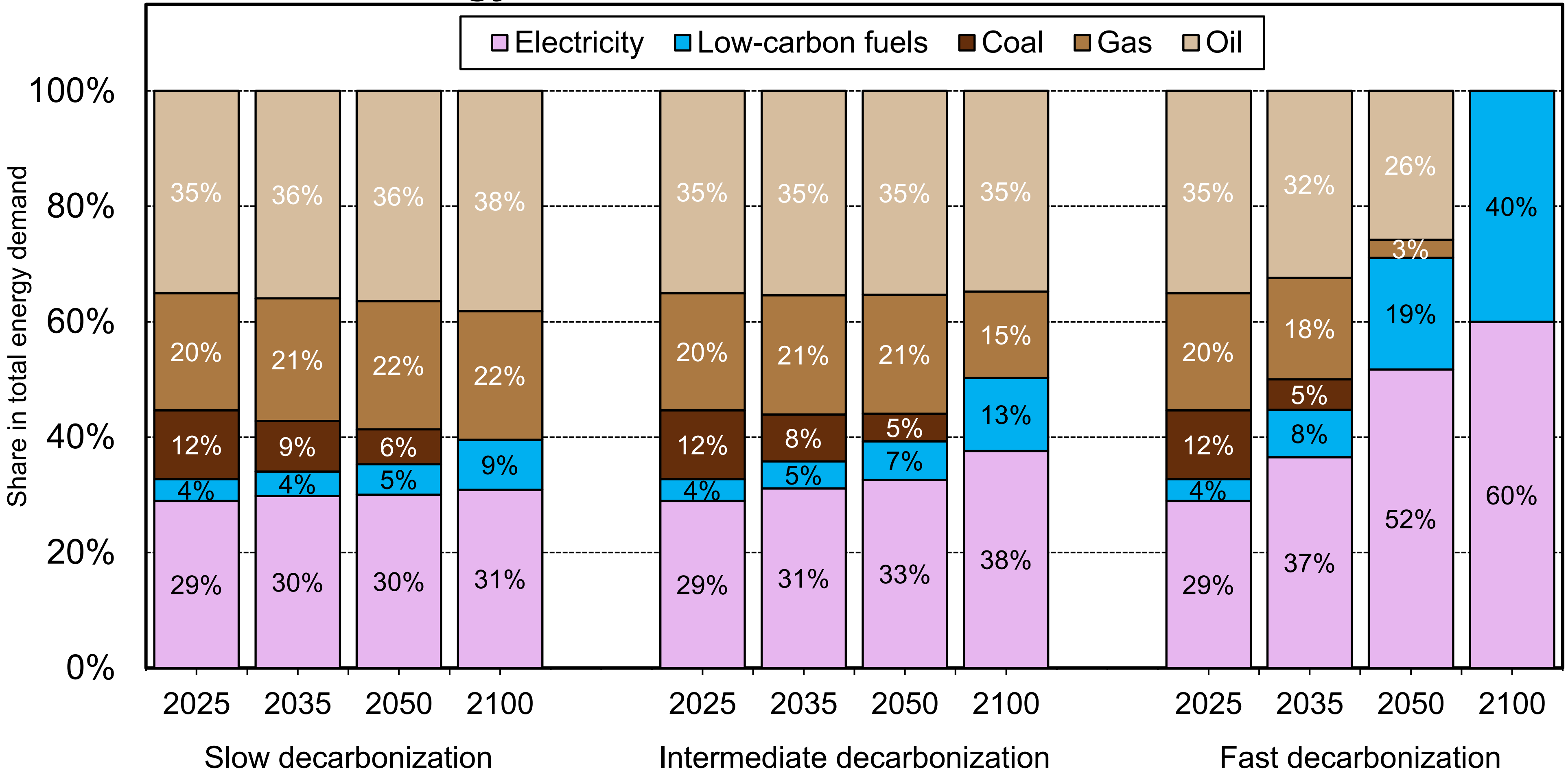

**Interpretation**. According to the Intermediate Decarbonization scenario (official country commitments and pledges), the share of electricity in total energy demand is scheduled to rise from 24% in 2025 to 53% in 2100, with large variations across sectors. **Note.** The energy demand of the household sector corresponds to direct energy consumption by households, primarily for residential heating and personal vehicle use. **Sources and series**: wseed.world (T2b)

## Fig. 39c. Share of Electrification in Total Energy Demand, Fast Decarbonization Scenario, 2025-2100



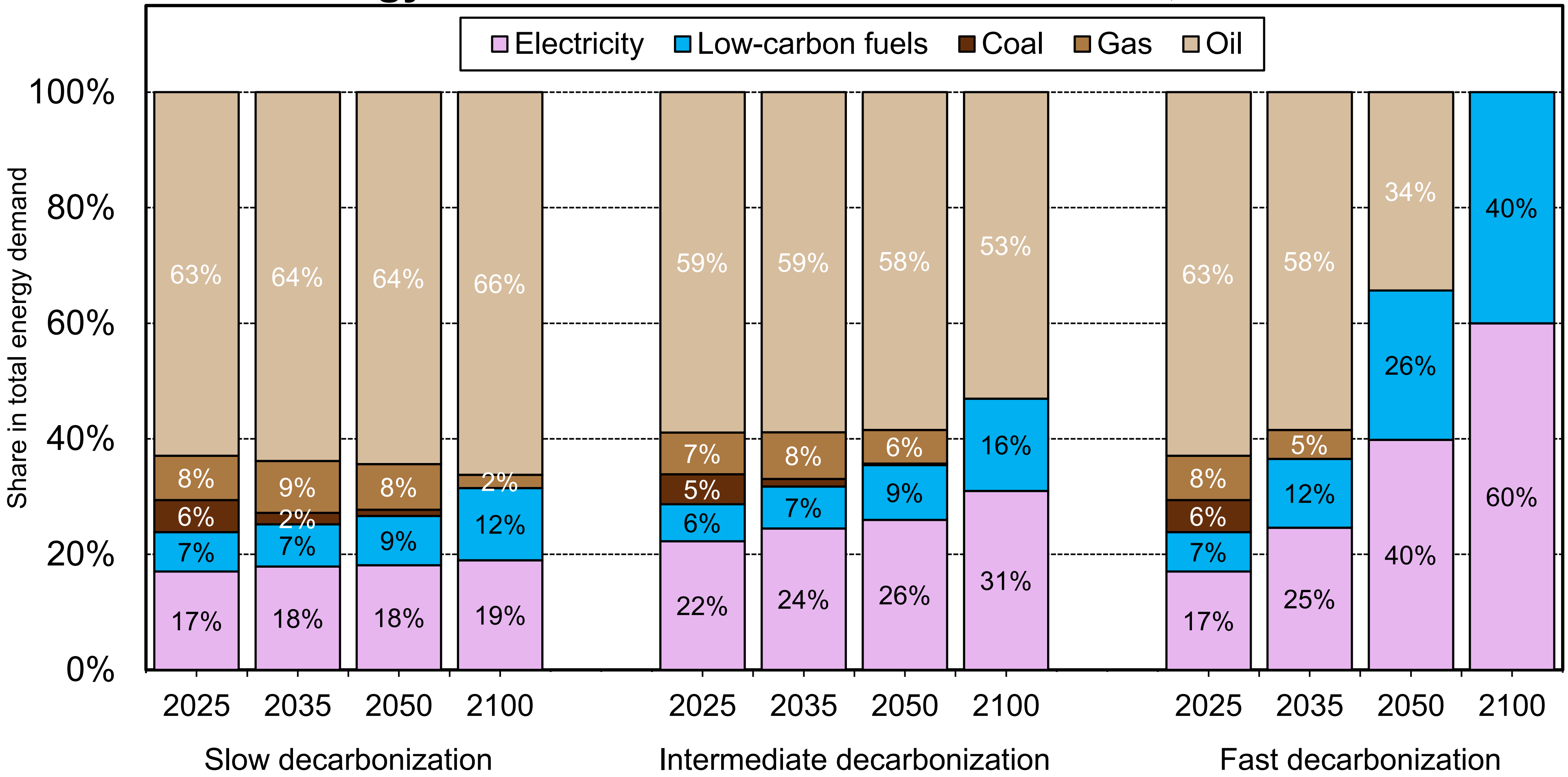

**Interpretation**. According to the Fast Decarbonization scenario (Sustainable Development), the share of electricity in total energy demand is scheduled to rise from 24% in 2025 to 78% in 2100, with large variations across sectors. **Note.** The energy demand of the household sector corresponds to direct energy consumption by households, primarily for residential heating and personal vehicle use. **Sources and series**: wseed.world (T2c)

## Fig. 40a. Slow, Intermediate, and Fast Decarbonization: Energy Demand of the Food Sector, 2025-2100



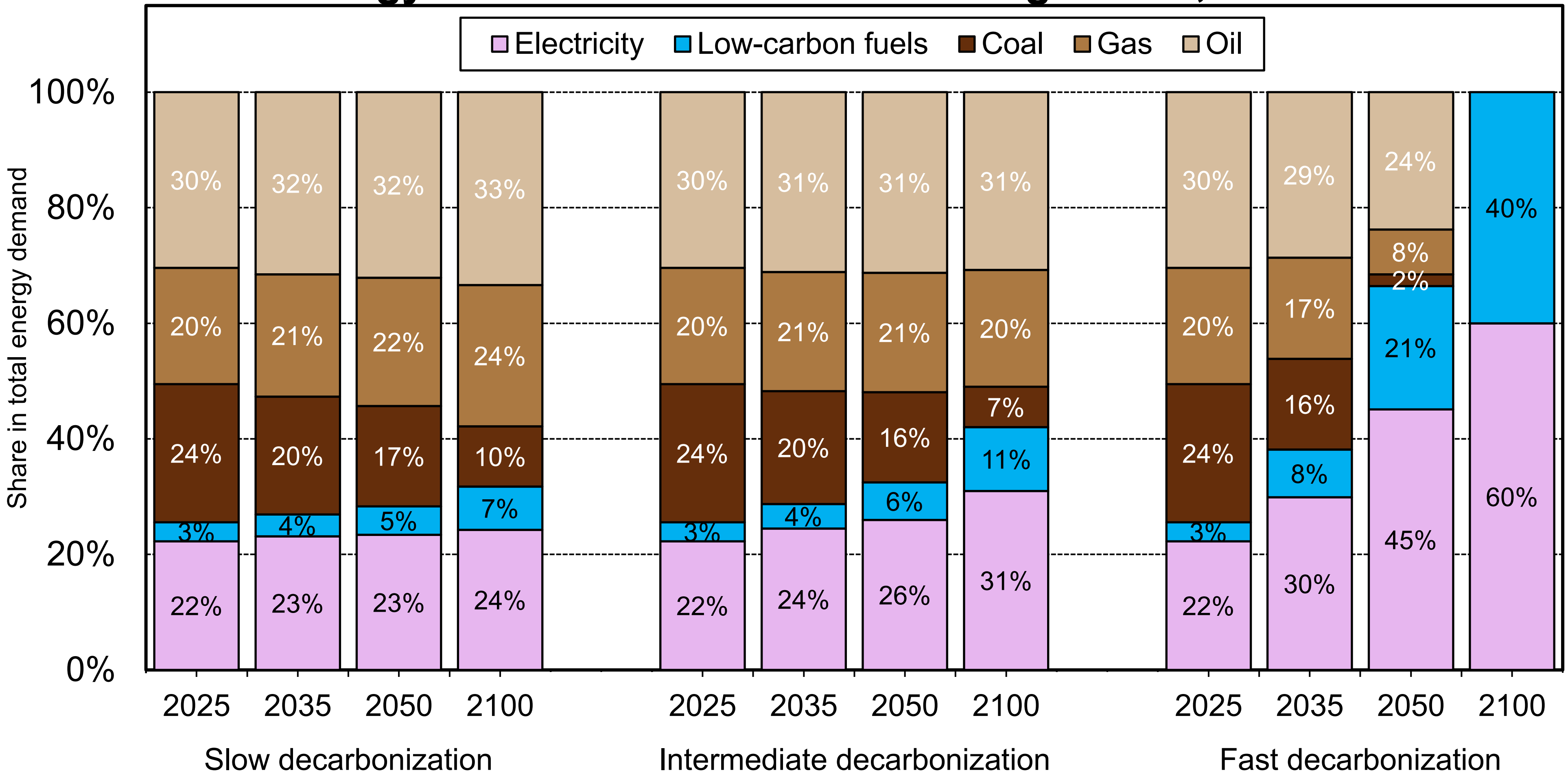

**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives and pledges), with different speeds across production sectors. **Sources and series**: wseed.world (T3a)

## Fig. 40b. Slow, Intermediate, and Fast Decarbonization: Energy Demand of the Construction Sector, 2025-2100



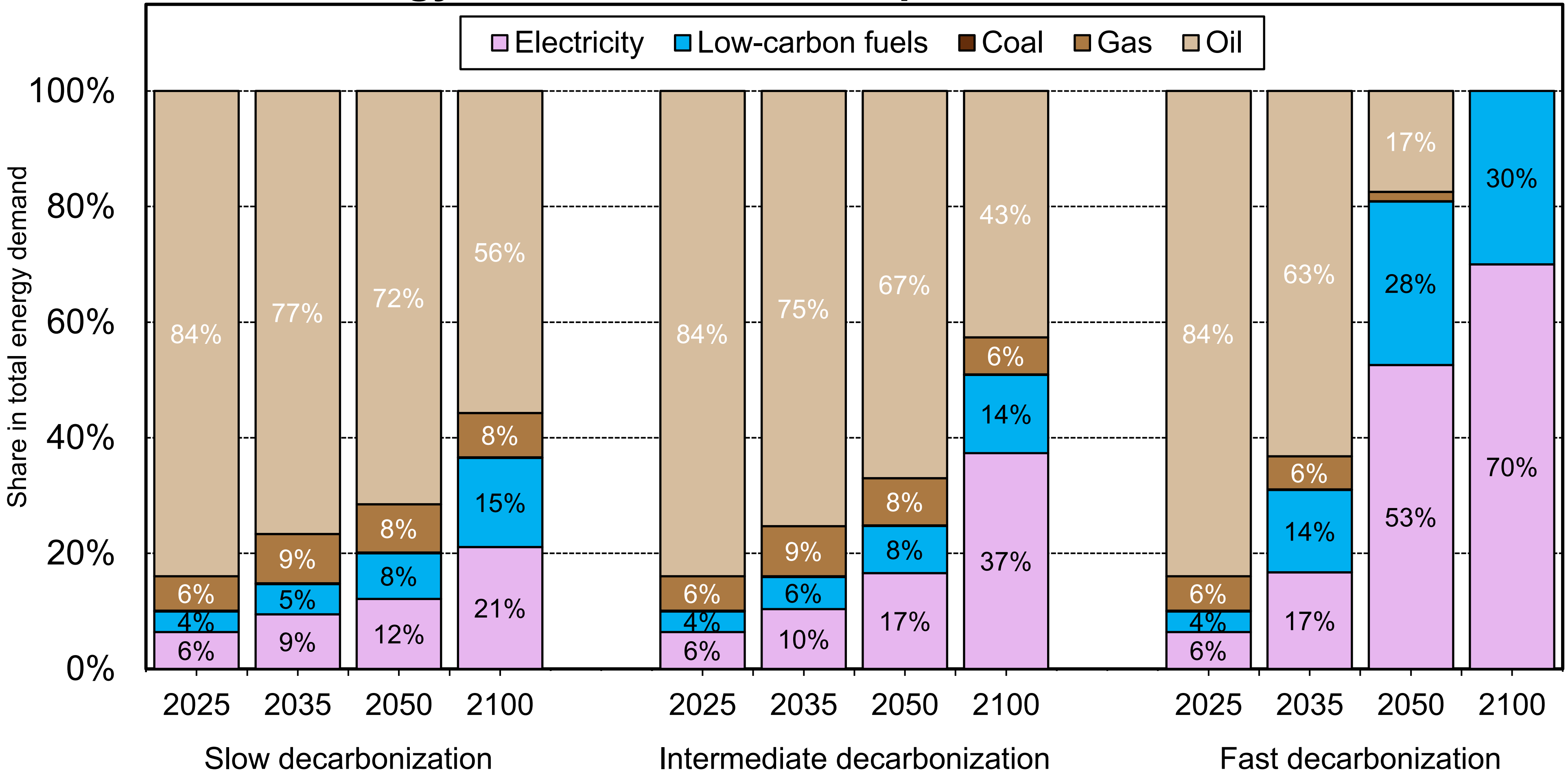

**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives and pledges), with different speeds across production sectors. **Sources and series**: wseed.world (T3b)

# Fig. 40c. Slow, Intermediate, and Fast Decarbonization: Energy Demand of the Manufacturing Sector, 2025-2100



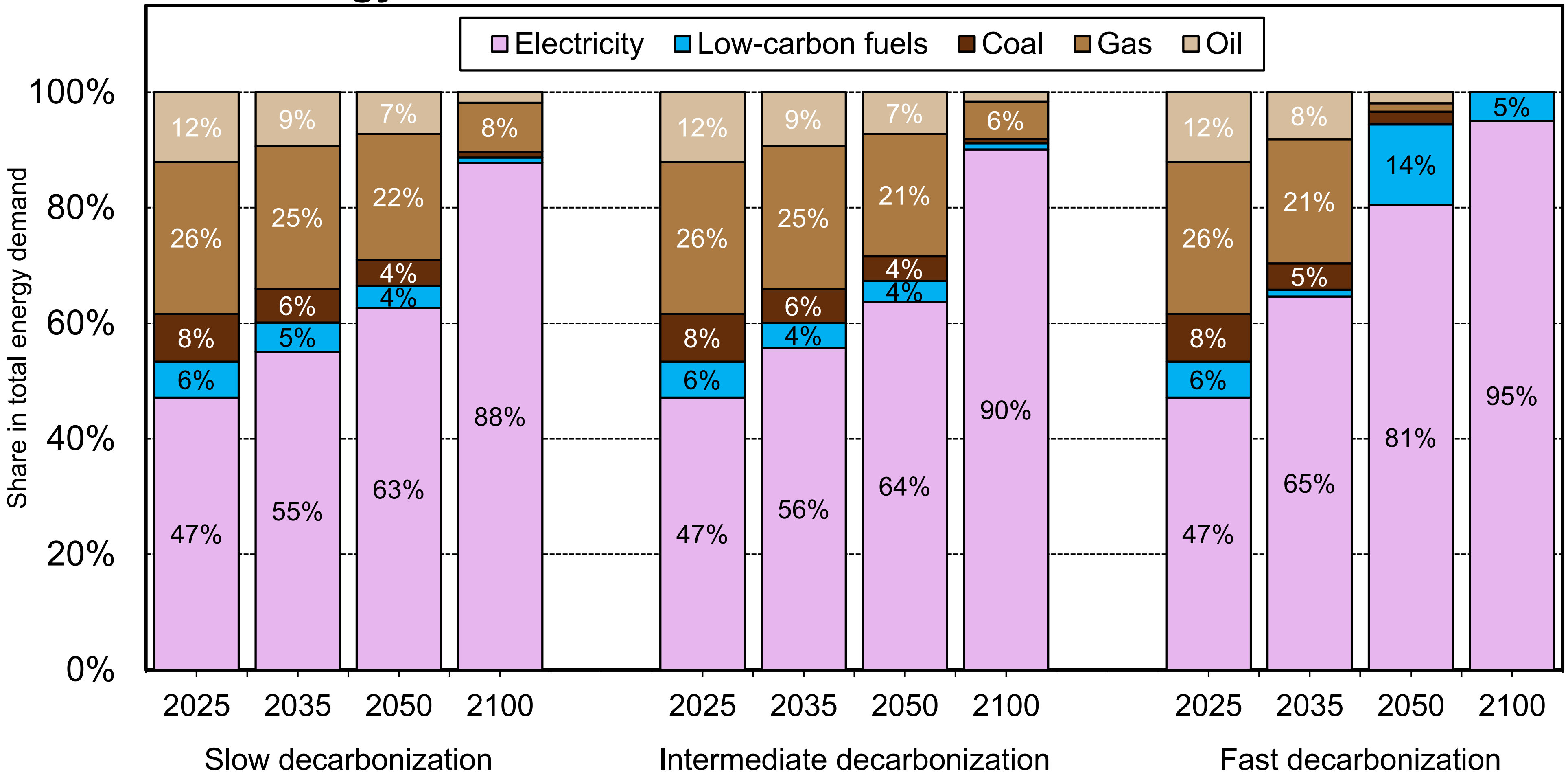

**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives and pledges), with different speeds across production sectors. **Sources and series**: wseed.world (T3c)

## Fig. 40d. Slow, Intermediate, and Fast Decarbonization: Energy Demand of the Transport Sector, 2025-2100



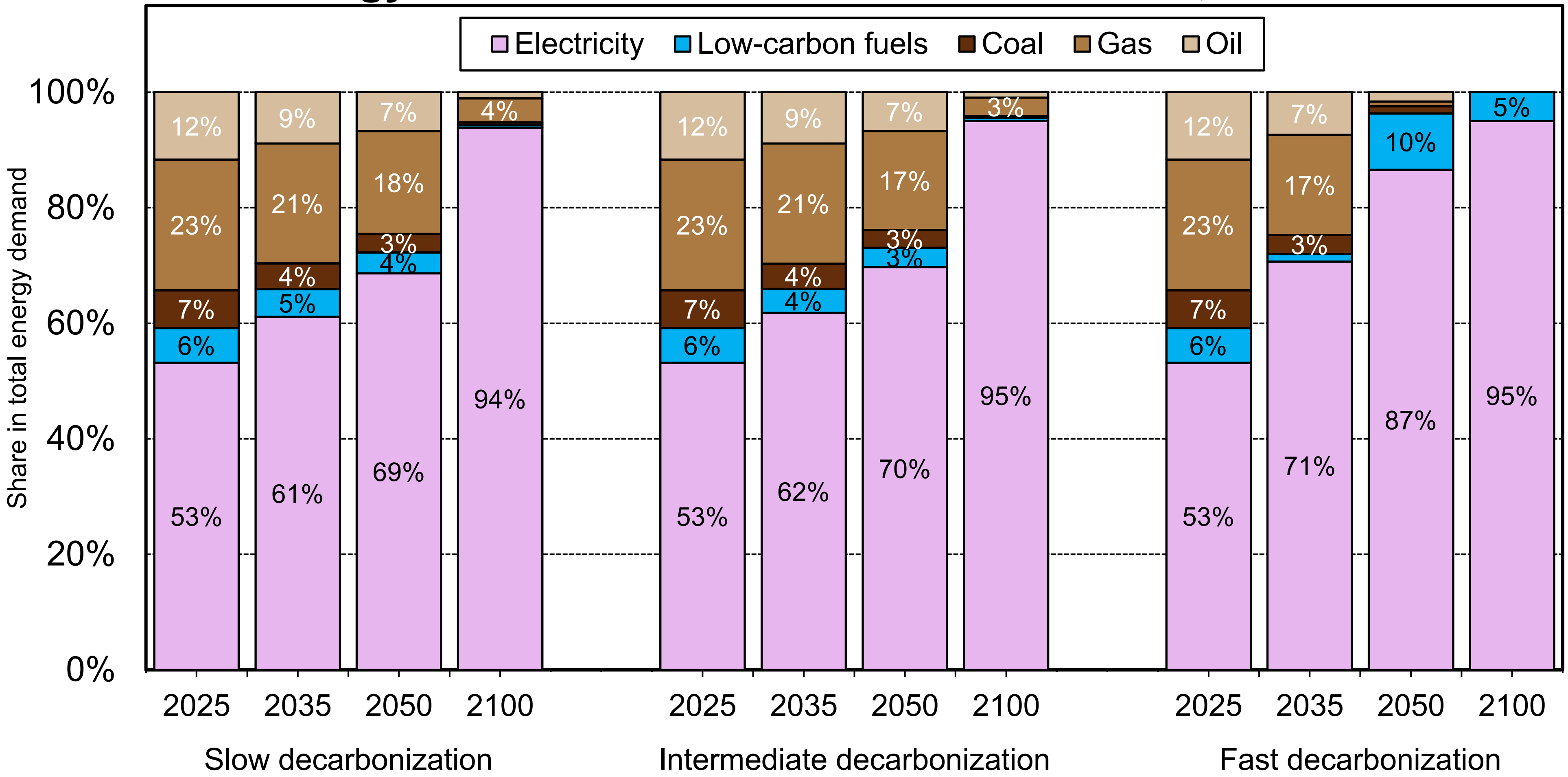

**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives and pledges), with different speeds across production sectors. **Sources and series**: wseed.world (T3d)

# Fig. 40e. Slow, Intermediate, and Fast Decarbonization: Energy Demand of the Education/Health Sector, 2025-2100



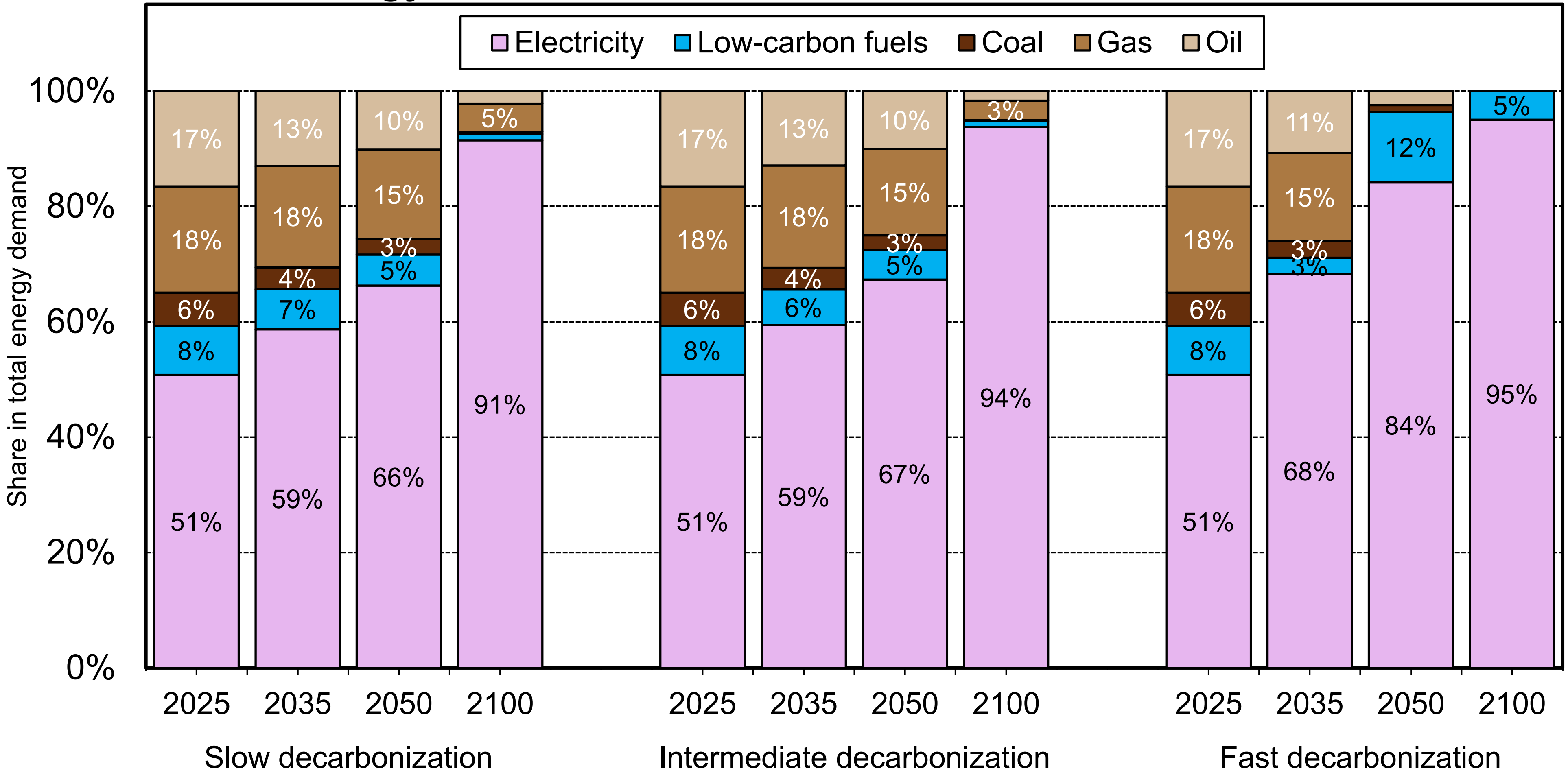

**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives and pledges), with different speeds across production sectors. **Sources and series**: wseed.world (T3e)

# Fig. 40f. Slow, Intermediate, and Fast Decarbonization: Energy Demand of the Leisure/Culture Sector, 2025-2100



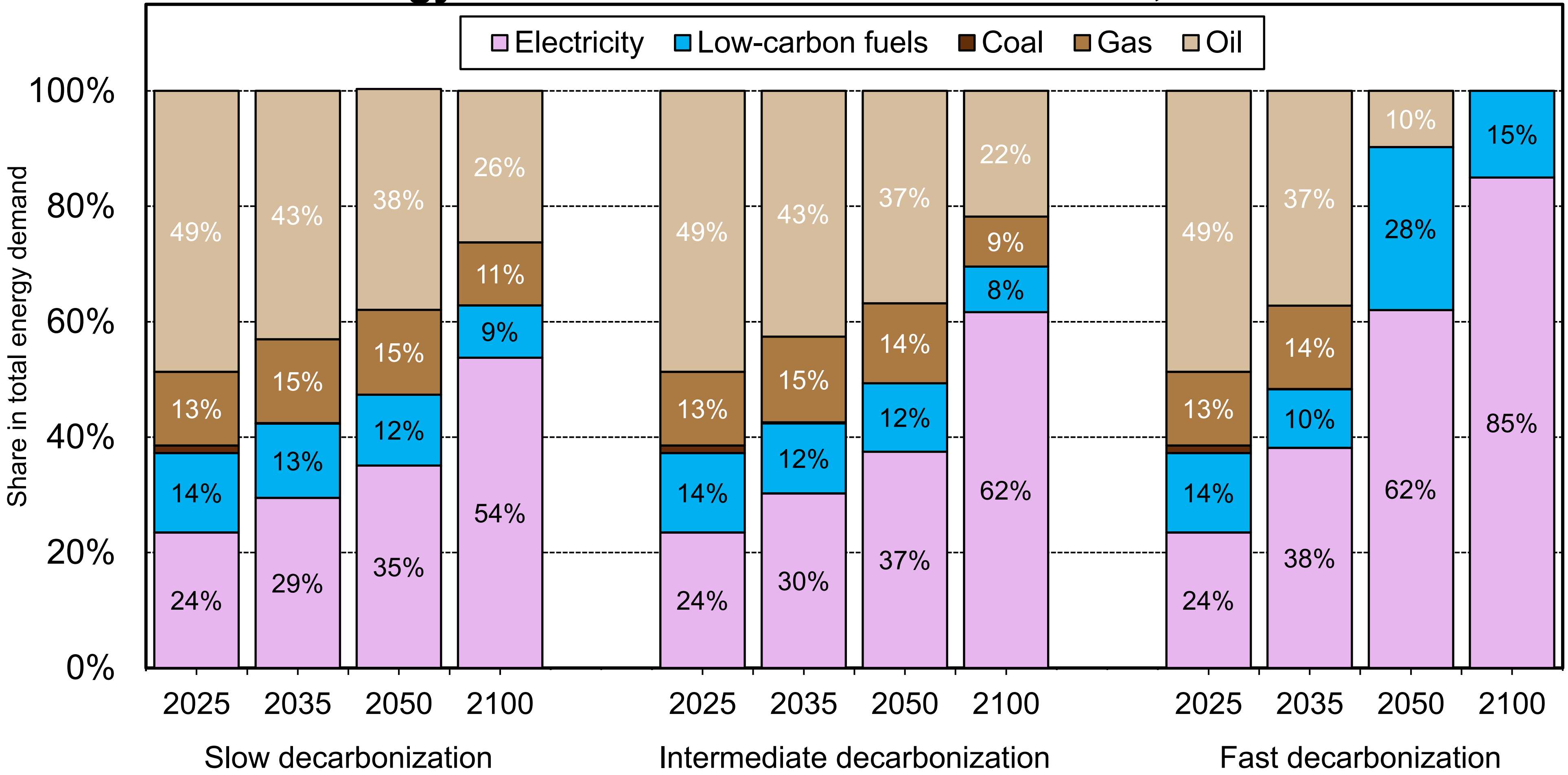

**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives and pledges), with different speeds across production sectors. **Sources and series**: wseed.world (T3f)

## Fig. 40g. Slow, Intermediate, and Fast Decarbonization: Energy Demand of the Other Services Sector, 2025-2100



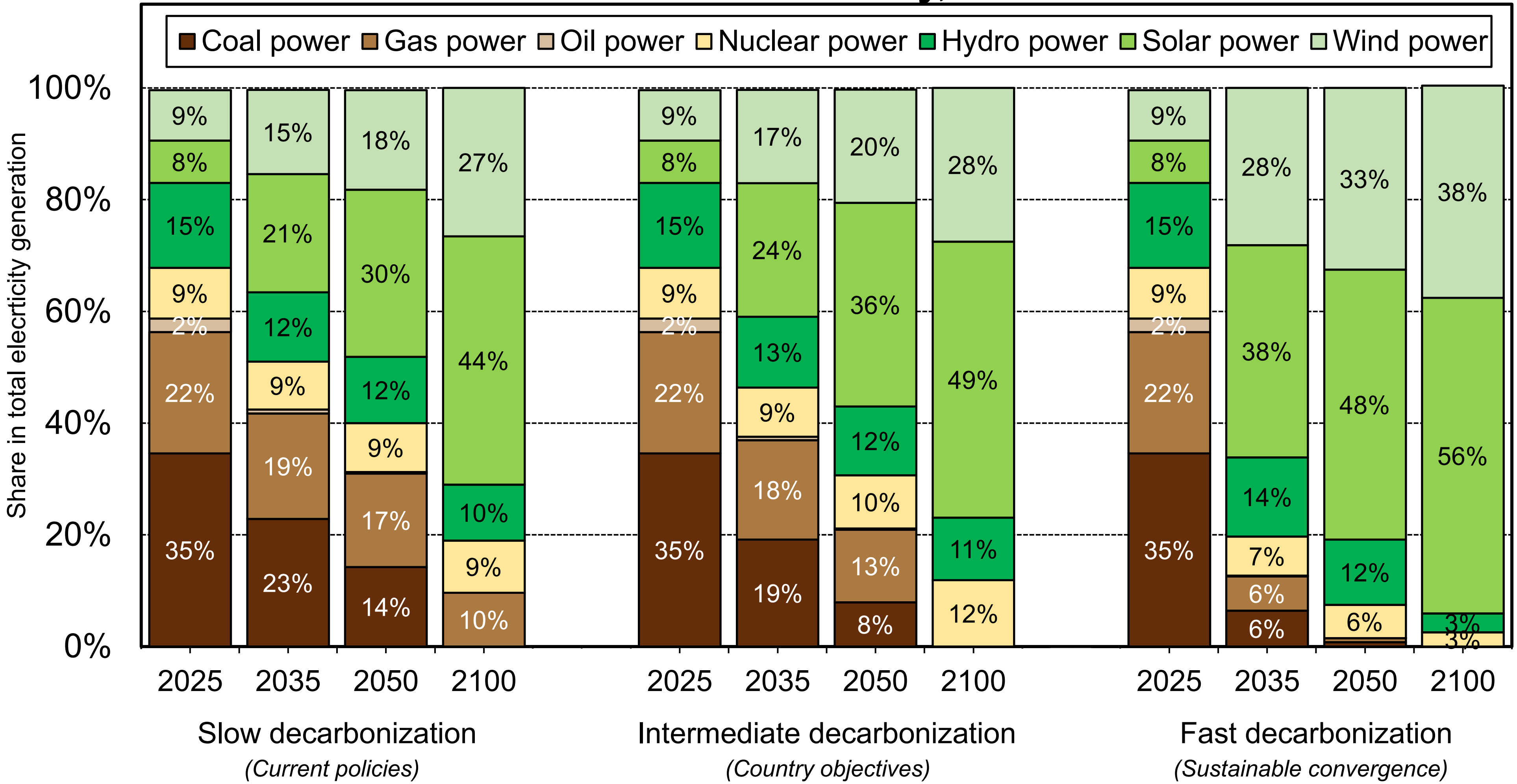

**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives and pledges), with different speeds across production sectors. **Sources and series**: wseed.world (T3g)

## Fig. 40h. Slow, Intermediate, and Fast Decarbonization: Energy Demand of the Household Sector, 2025-2100

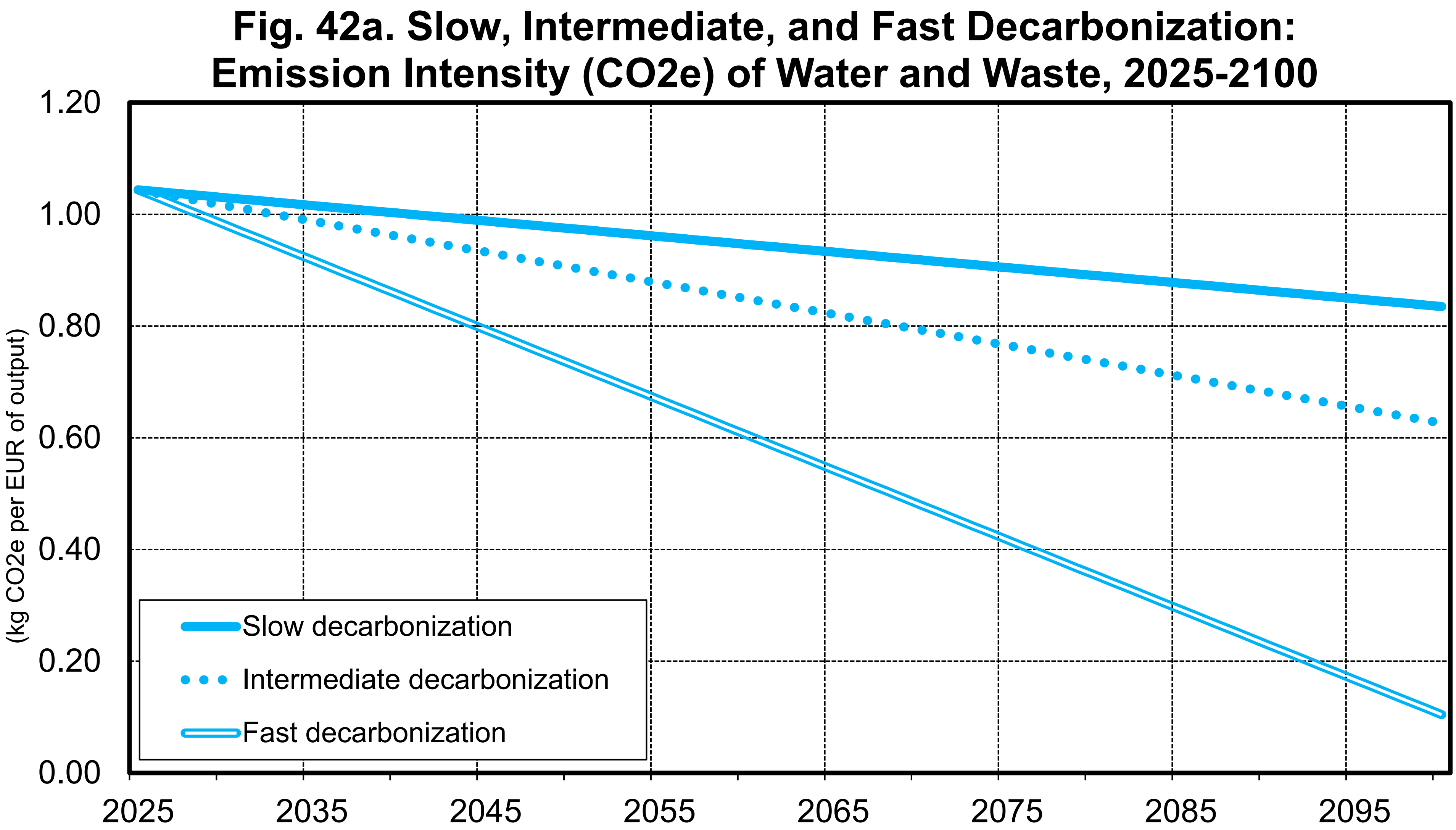



**Interpretation**. The Fast Decarbonization scenario (sustainable development) is characterized by large phase-out of fossil fuels as compared to both the Slow decarbonization scenario (current policies) and the Intermediate decarbonization scenario (official country objectives and pledges), with different speeds across production sectors. Note. The energy demand of the household sector corresponds to direct energy consumption by households, primarily for residential heating and personal vehicle use. **Sources and series**: wseed.world (T3h)

# Fig. 41. Slow, Intermediate, and Fast Decarbonization: Generation of Electricity, 2025-2100

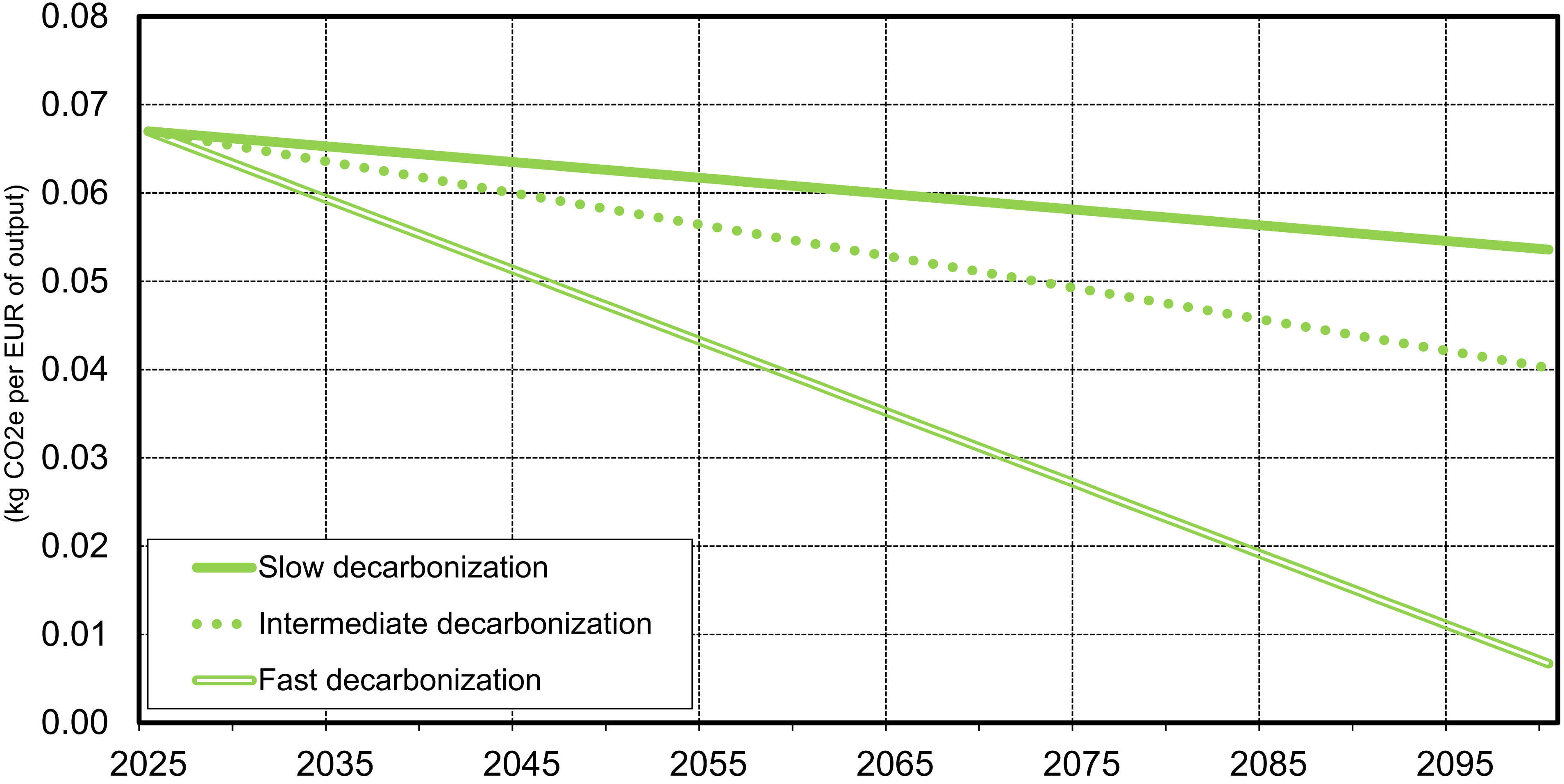



**Interpretation**. Under the sustainable convergence scenario (FD), the decarbonization of electricity should accelerate considerably as compared to both current policies (SD)) and official country objectives and pledges (ID). In particular, fossil fuel power should represent less than 1% of total electrity generation by 2050 (vs 31% and 21% according to SD and ID scenarios). **Sources and series**: wseed.world (T4)



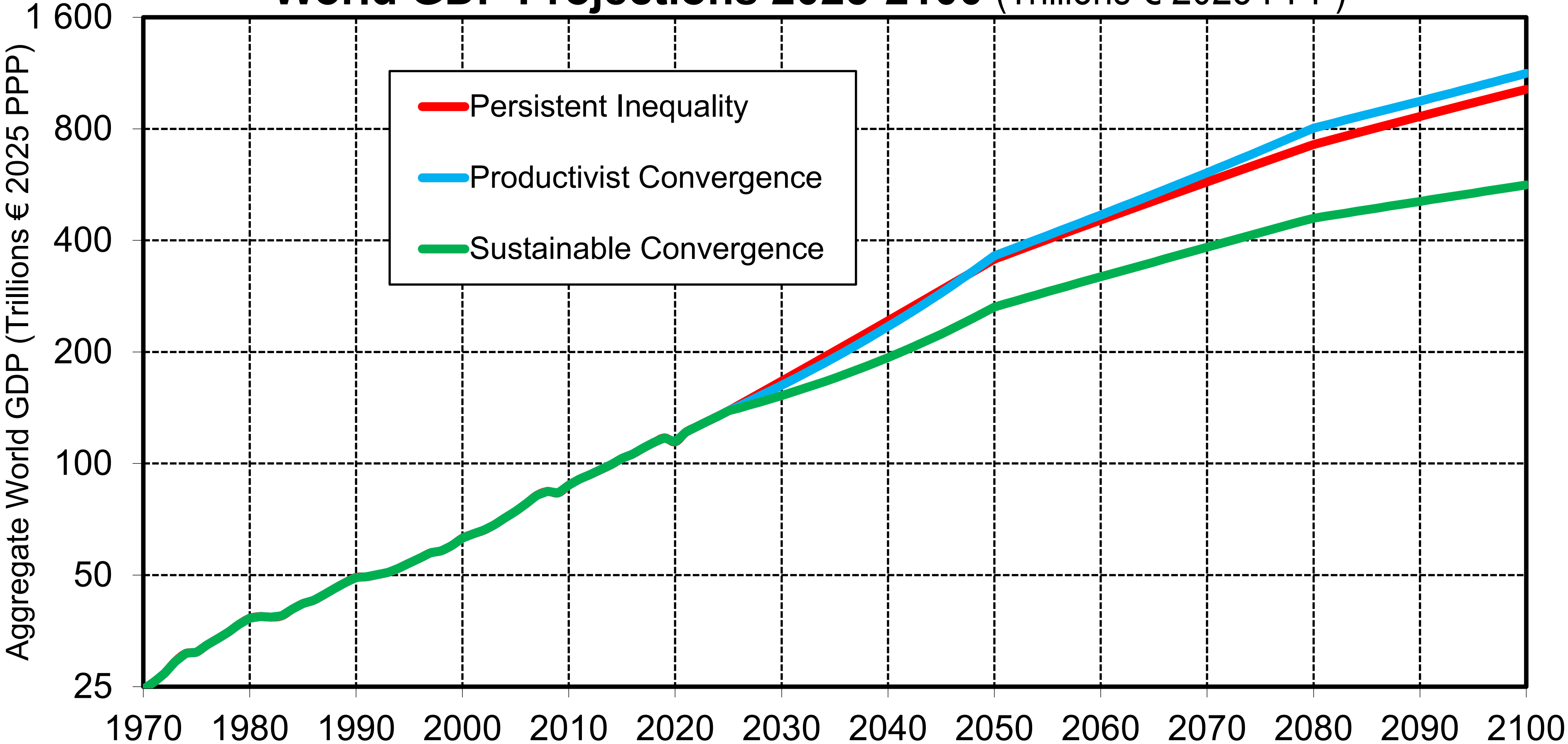

**Interpretation**. Under the sustainable convergence scenario (FD), the decline in GHG emissions intensities in industrial processes (water and waste, CO2 and other GGH) is projected to accelerate considerably as compared to both SD and ID scenarios.
**Sources and series**: wseed.world (T5a)

## Fig. 42b. Slow, Intermediate, and Fast Decarbonization: Emission Intensity (CO2e) of Manufacturing, 2025-2100



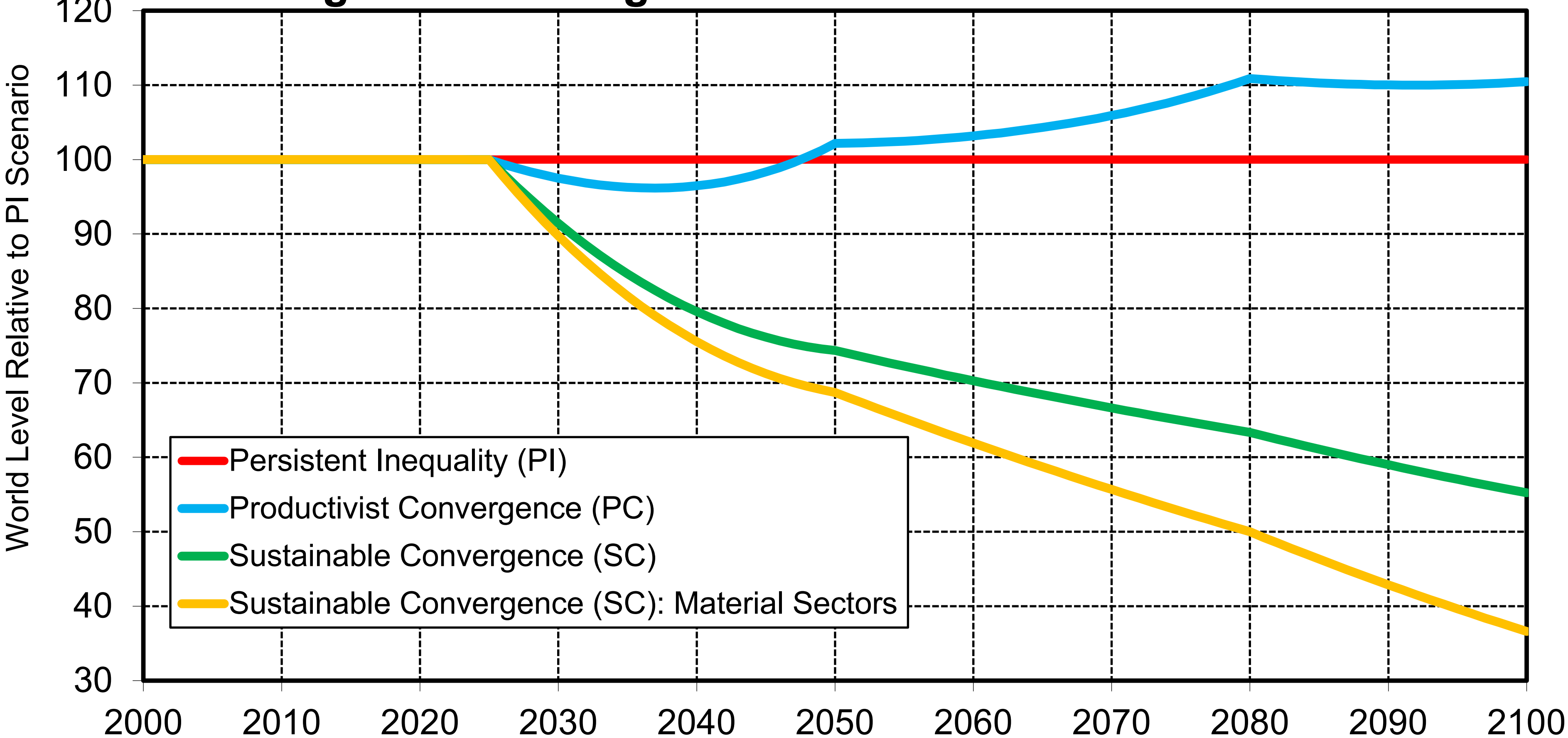

**Interpretation**. Under the sustainable convergence scenario (FD), the decline in GHG emissions intensities in industrial processes (manufacturing, CO2 and other GGH) is projected to accelerate considerably as compared to both SD and ID scenarios.
**Sources and series**: wseed.world (T5b)

## Fig. 43a. Sustainable Convergence vs Other Scenarios: World GDP Projections 2025-2100 (Trillions € 2025 PPP)



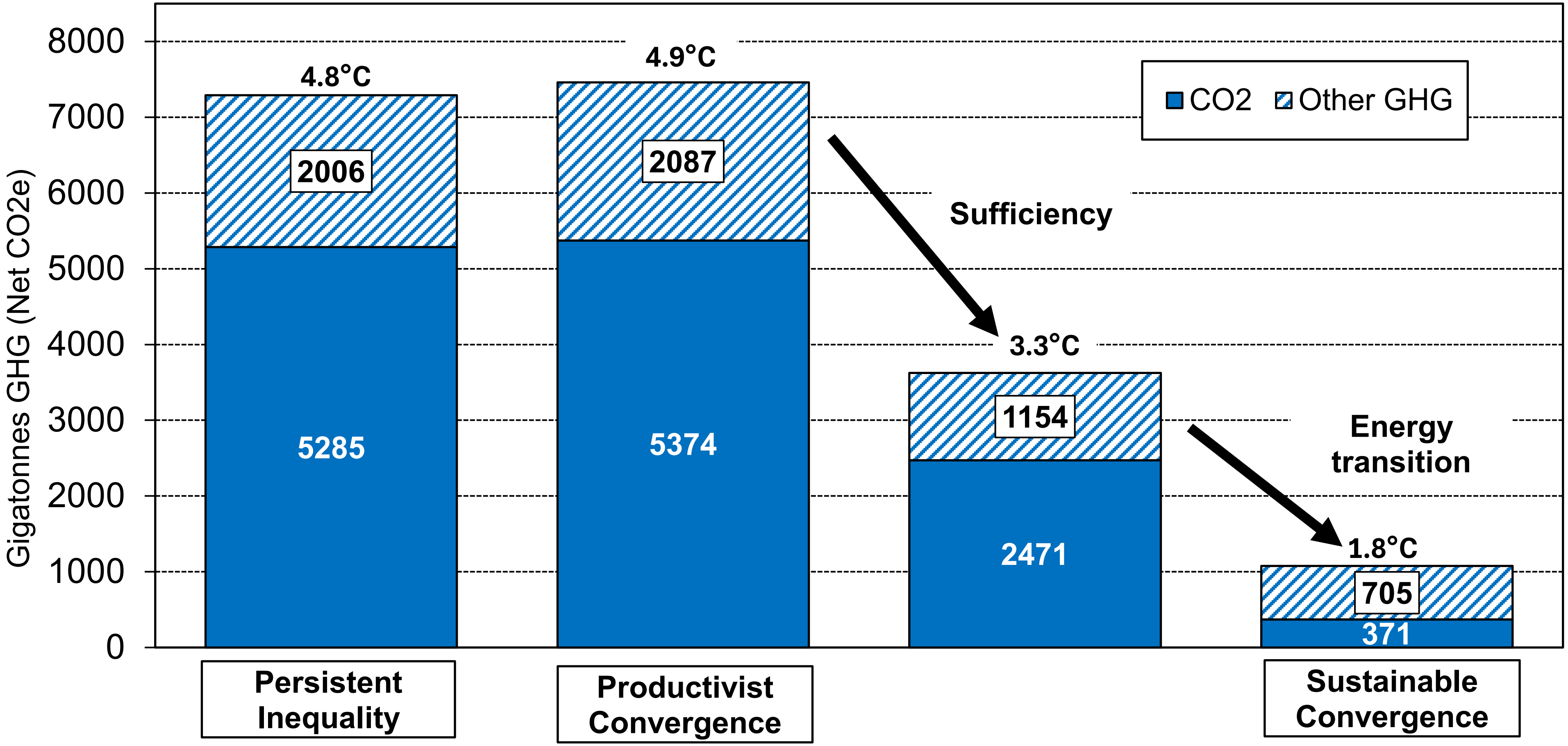

**Interpretation.** According to the sustainable convergence scenario, aggregate world GDP rises from 139T (Trilllions Euros 2025 PPP) in 2025 to 565T in 2100, vs 1023T in the persistent inequality scenario and 1130T in the productivist convergence scenario. In effect, the real growth rate of world GDP, which was equal to 3.2% per year between 1970 and 2025, is projected to slow down to 1.9% per year between 2025 and 2100 in the sustainable convergence scenario, vs 2.7% and 2.8% per year in the other two scenarios. **Sources and series**: wseed.world (R0a)

# Fig. 43b. Sustainable Convergence Scenario: Large Material Degrowth Relative to Other Scenarios



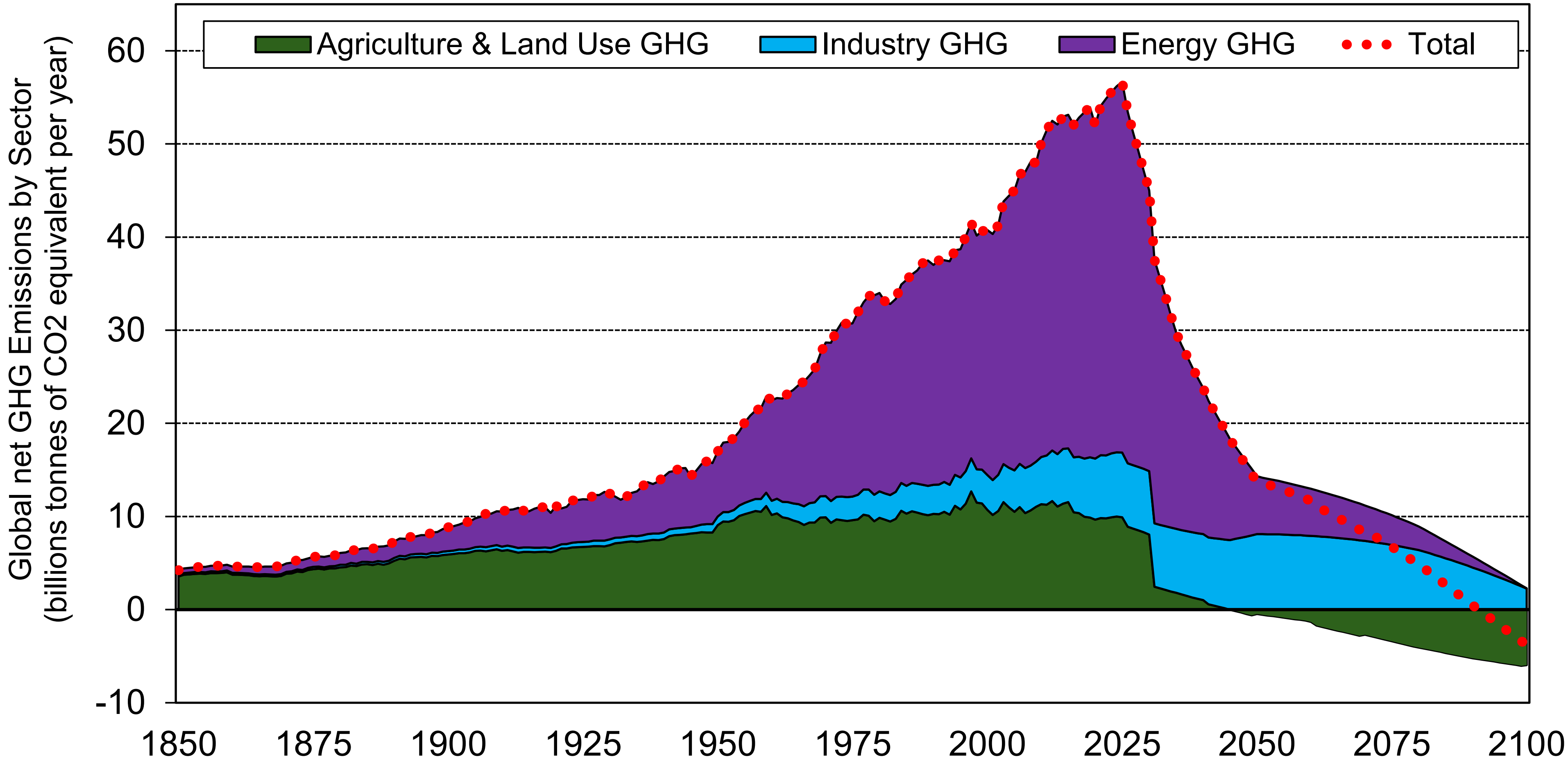

**Interpretation.** According to the Sustainable Convergence scenario, aggregate world GDP is projected to be equal to 73% of the PI level (Persistent Inequality scenario) in 2050 and 55% in 2100. The fall is even larger if we focus on material sectors (food/agriculture, construction/housing, manufacturing, energy/mining, transport), where total world expenditure (final consumption and investment) in the SC scenario is projected to be equal to 67% of PI level in 2050 and 37% in 2100. **Sources and series**: wseed.world (R0b)

## Fig. 44. Sufficiency & Energy Transition Are Complementary
(Projected Emissions & Temperature of Core Scenarios 2026-2100)



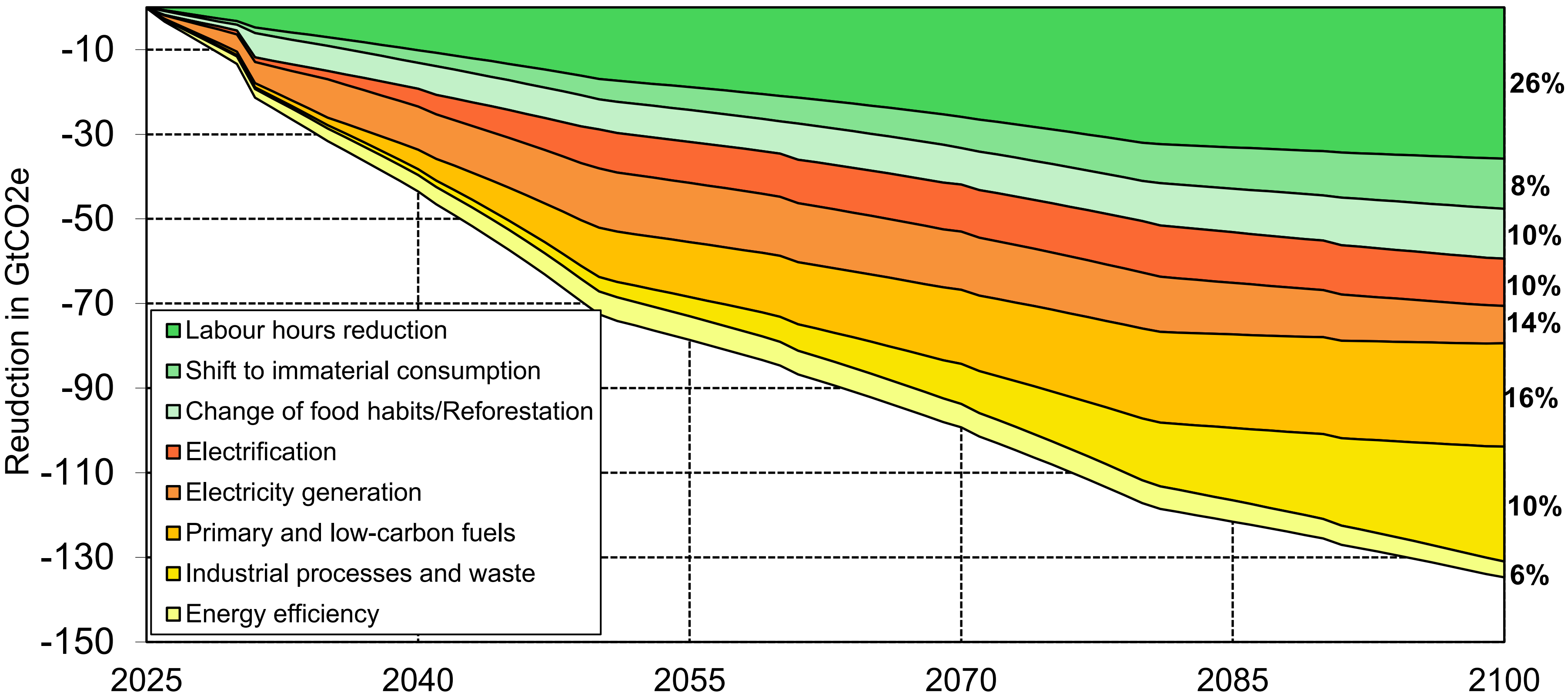

**Interpretation.** In order to reduce GHG emissions and keep warming below 2°, both socioeconomic sufficiency - including labour hours reduction, shift to immaterial consumption, change of food habits & implied reforestation - and energy system transformation play an indispensable and complementary role. **Notes.** The figure shows projected cumulative emissions and temperature rise of the core scenarios, where persistent inequality and productivist convergence come with slow decarbonization and sustainable convergence with fast decarbonization.. **Sources and series**: wseed.world (X1)

# Fig. 45. Sustainable Convergence and Fast Decarbonization: The Key Role of Fossil Fuels Phase-Out & Deforestation Ban



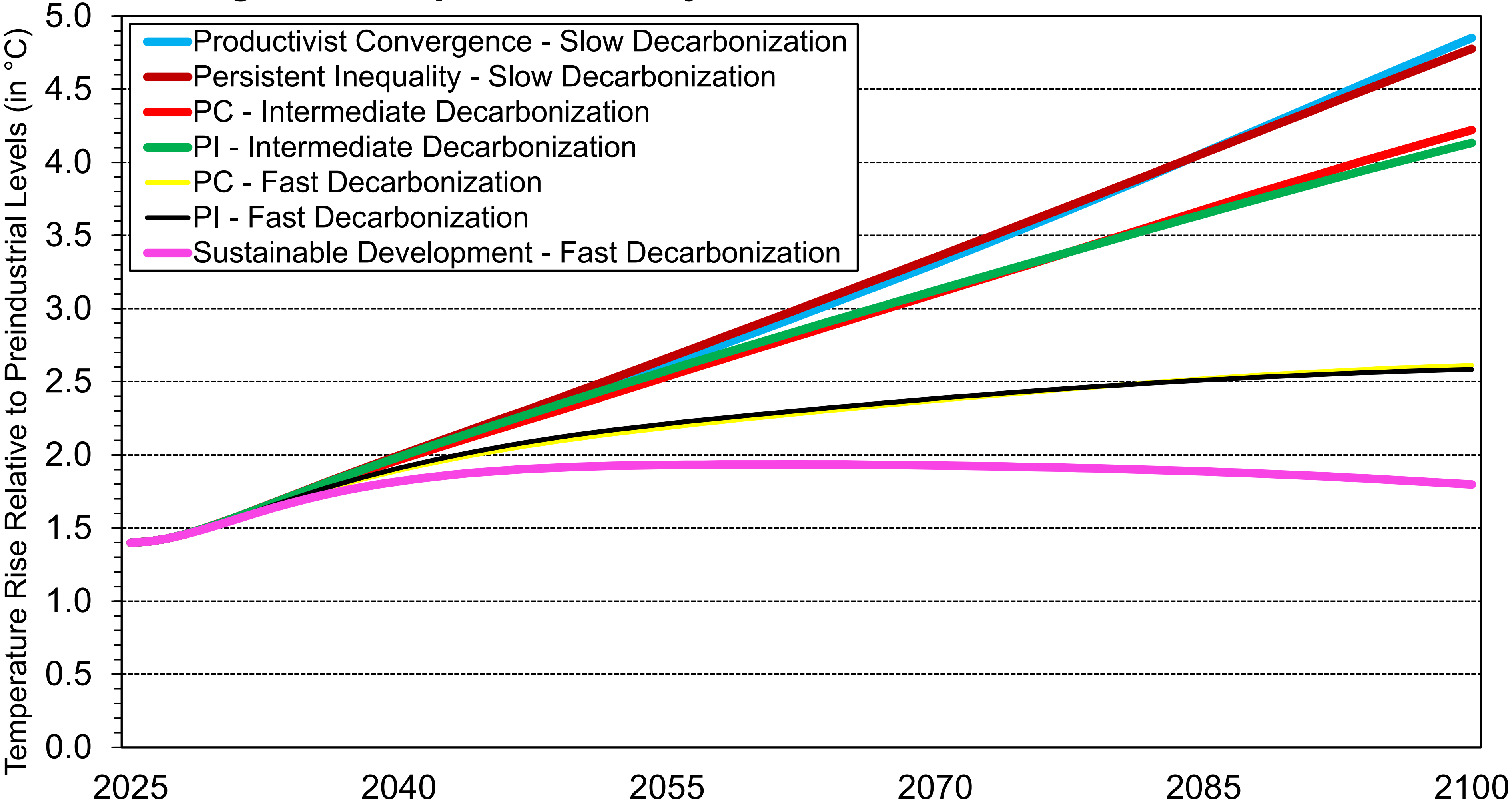

**Interpretation.** Under the sustainable convergence/fast decarbonization scenario, the sharp decline of GHG emissions over the 2026-2100 period is made possible by the rapid phase-out of fossil fuels (fall of Energy GHG) and a strict deforestation ban enforced in 2030, followed by gradual reforestation bringing world forest cover back to 1900 level by 2100 (leading to negative Agriculture & Land-Use GHG in 2050-2100, and slight negative total net GHG emissions by 2100). In contrast, Industry GHG (cement, waste, etc.) are more difficult to remove entirely.
**Note:** Observed series 1850-2025. Projected series 2026-2100 (Sustainable Convergence Scenario with Fast Decarbonization). **Sources and series**: wseed.world (X2)

# Fig. 46. Sufficiency & Energy Transition Are Complementary
(Decomposition of Emissions Reduction Drivers 2026-2100)




**Interpretation**. In order to reduce GHG emissions and keep warming below 2°, both socioeconomic sufficiency - including labour hours reduction, shift to immaterial consumption, change of food habits & implied reforestation - and energy system transformation play an indispensable and complementary role. **Notes:** The figure shows Shapley decomposition of the annual difference in emissions (in GTCO2e) between the Productivitst Convergence - Slow Decarbonization Scenario and the Sustainable Convergence - Fast Decarbonization Scenario. Percentage values on the right show contribution over entire 2025-2100 period. **Sources and series**: wseed.world (X3)

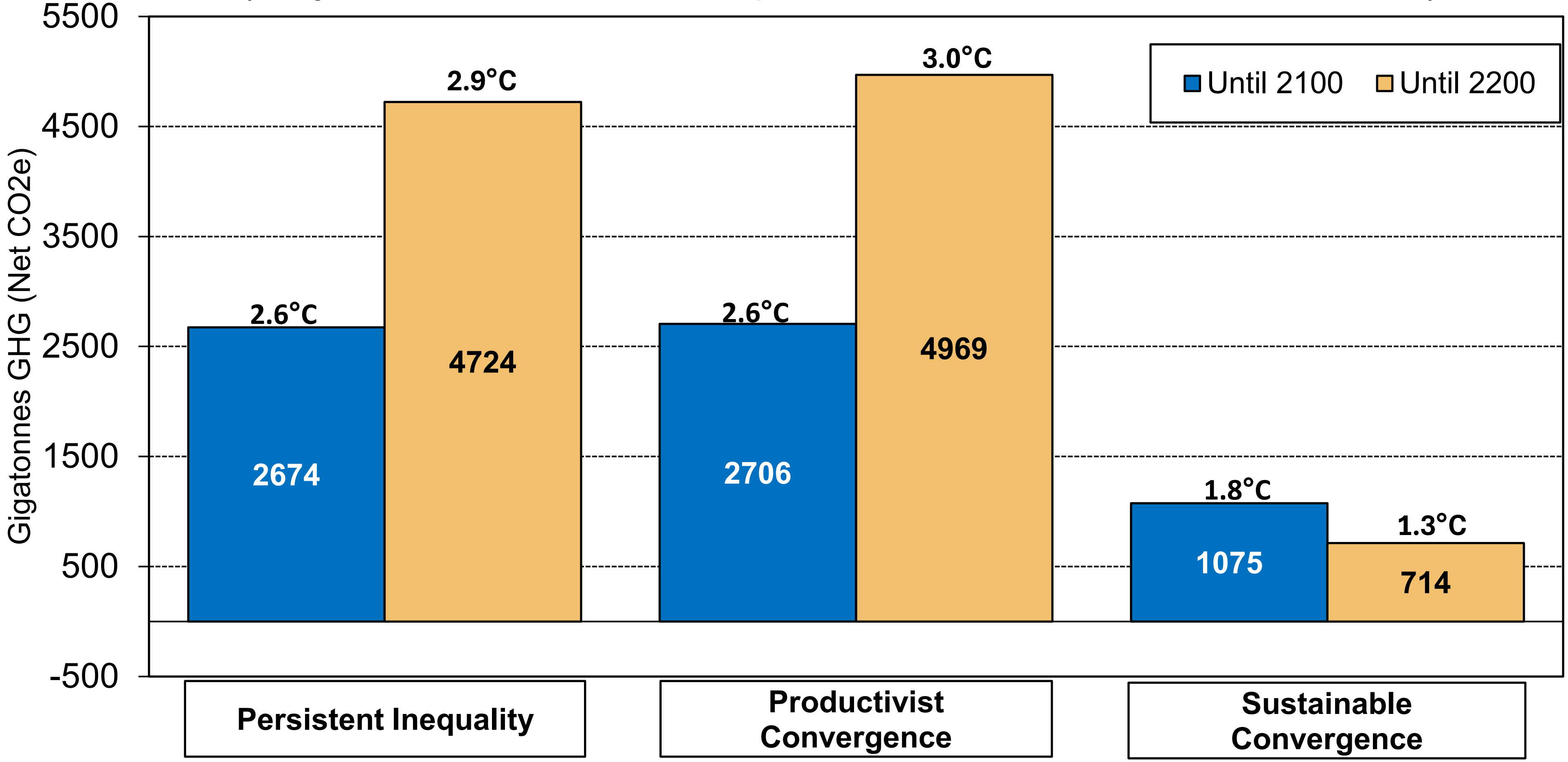
## Fig. 47. Temperature Projections: Core Scenarios 2026-2100




**Interpretation.** The Sustainable Development/Fast Decarbonization scenario is the only one leading below 2°C by 2100. The PC and PI scenarios under Slow Decarbonization (current policies) lead to 4.8-4.9°C, while the PC and PI scenarios with Intermediate Decarbonization (official country commitments) lead to 4.1-4.2°C. The PC and PI scenarios with Fast Decarbonization lead to 2.6°C, but such a policy mix appears to be very unlikely. In any case, emissions and temperature rise would continue after 2100 under this scenario (no net zero emission).
**Sources and series**: wseed.world (X4)

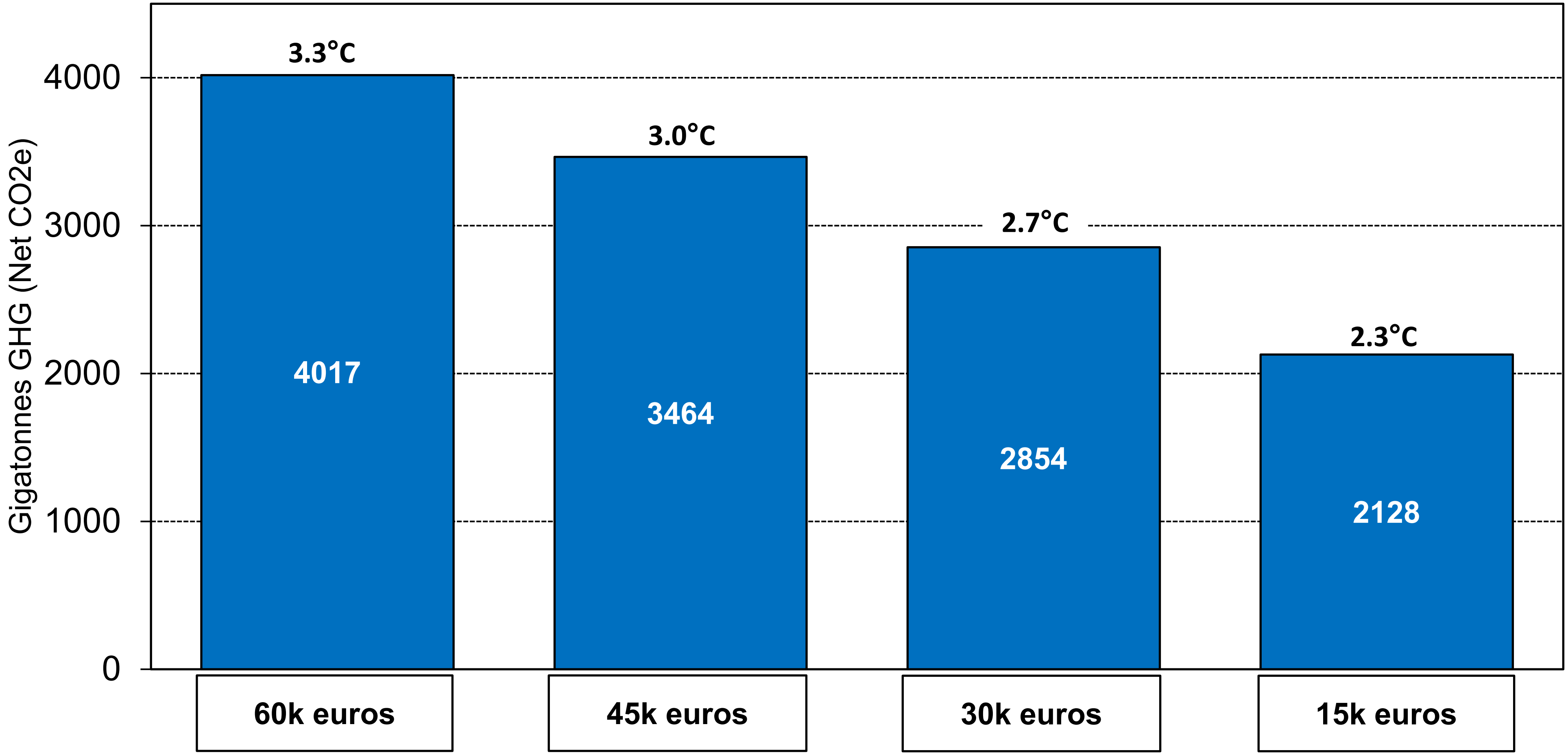
## Fig. 48. Without Sufficiency, Emissions Will Continue After 2100

(Projected Emissions & Temperature under Fast Decarbonization)




**Interpretation.** In the unlikely situation where the PI and PC scenarios are combined with Fast Decarbonizaion, positive emissions and temperature rise will continue well beyond 2100. **Note.** The 2200 values are a simplistic approximation where we hold 2100 net emissions constant. They illustrate that Persistent Inequality and Productivist Convergence have not reached net zero by 2100. **Sources and series**: wseed.world (X5)

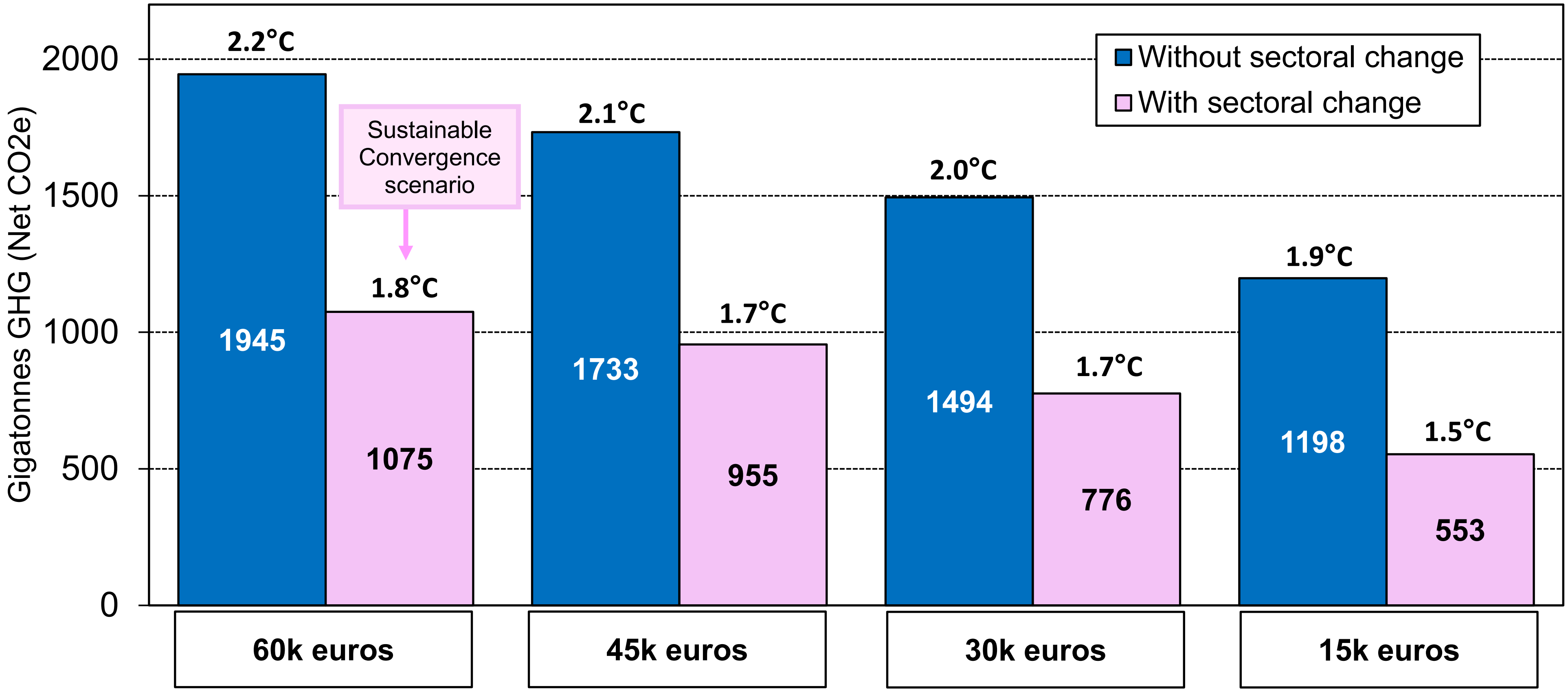
**Fig. 49. Degrowth Without Structural Change is not Enough**
(Projected Emissions & Temperature With Intermediate Decarbonization)




**Interpretation.** In the absence of structural change (no shift to immaterial consumption, no change in food habits & no implied reforestation), and under the assumption of Intermediate Decarbonization, the reduction of the per capita GDP target in 2100 (via shorter labour hours) is not sufficient to bring global warming below 2°C, even with a 15k Euros 2025 PPP per capita GDP target.
**Sources and series**: wseed.world (X6)

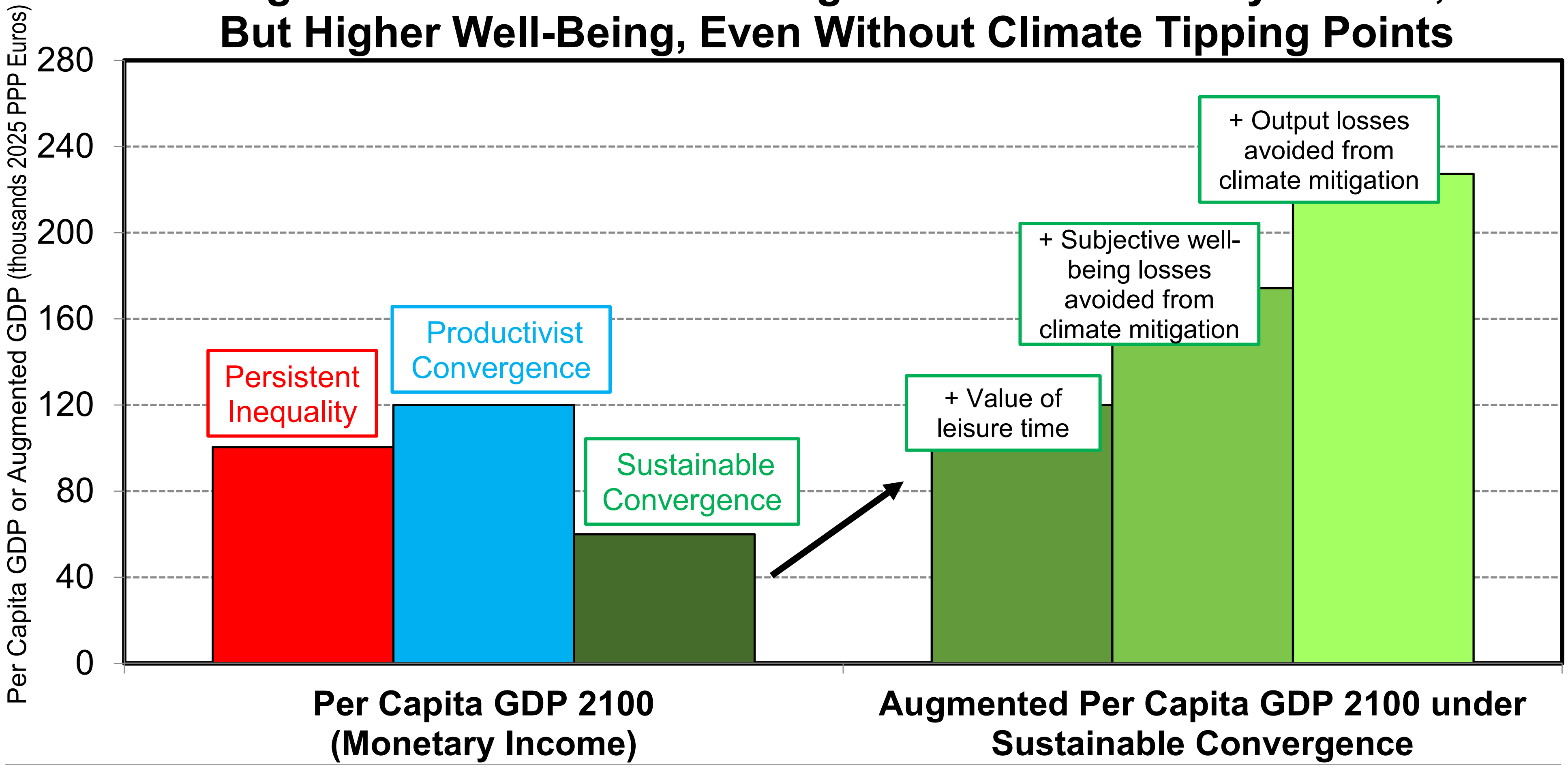
## Fig. 50. Targeted Sufficiency Can Be More Effective Than Large Uniform Degrowth

(Projected Emissions & Temperature Under Fast Decarbonization)



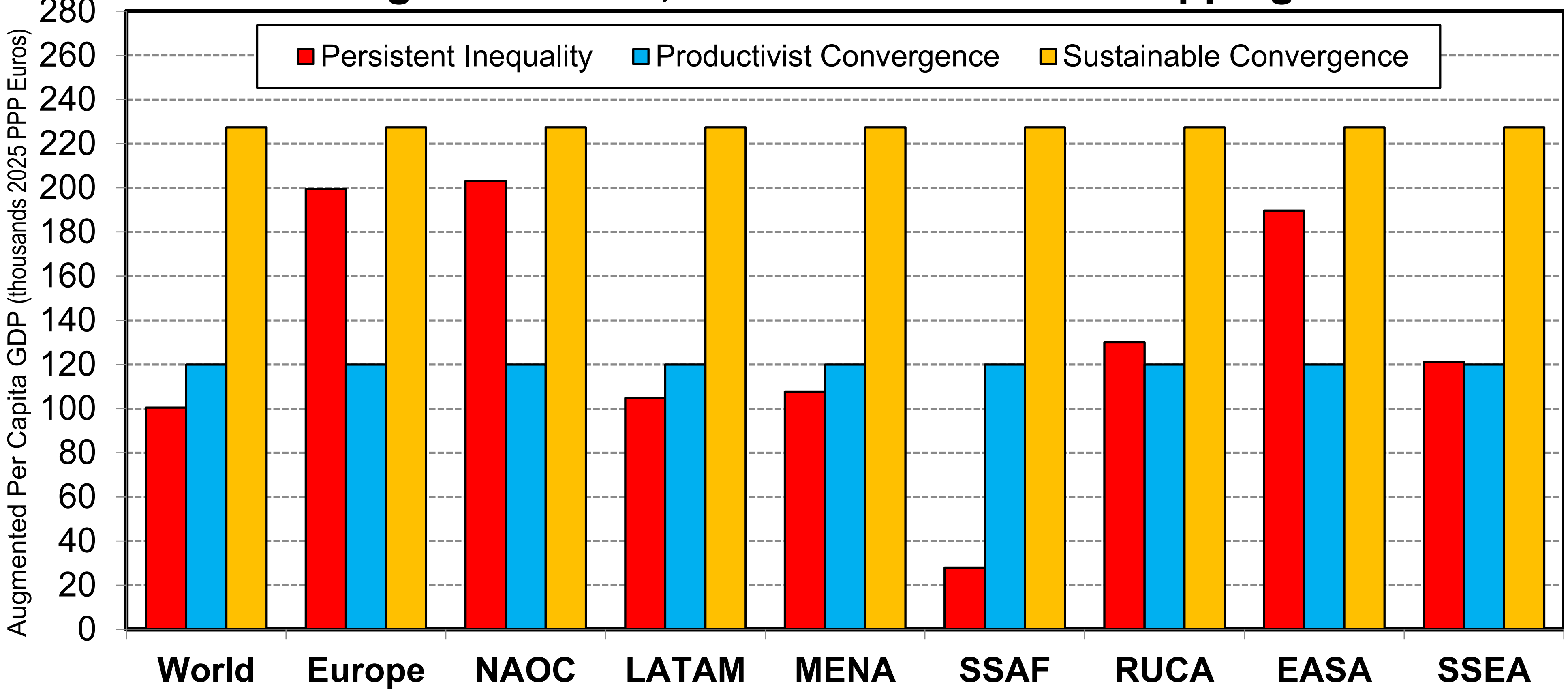

**Interpretation.** Targeted sufficiency, i.e. global convergence of all countries to 60k Euros 2025 PPP in per capita GDP by 2100, together with sectoral change (consumption shit to immaterial sectors, change in food habits & implied reforestation), leads to 1.8°C temperature rise in 2100, i.e. less than the 1.9°C associated to large uniform degrowth (15k for all in 2100) but no structural change. **Note**. It might be difficult to combine 15k with structural change, as this implies large reduction in average food intake. **Sources and series**: wseed.world (X7)

# Fig. 51a. Sustainable Convergence: Less Monetary Income, But Higher Well-Being, Even Without Climate Tipping Points



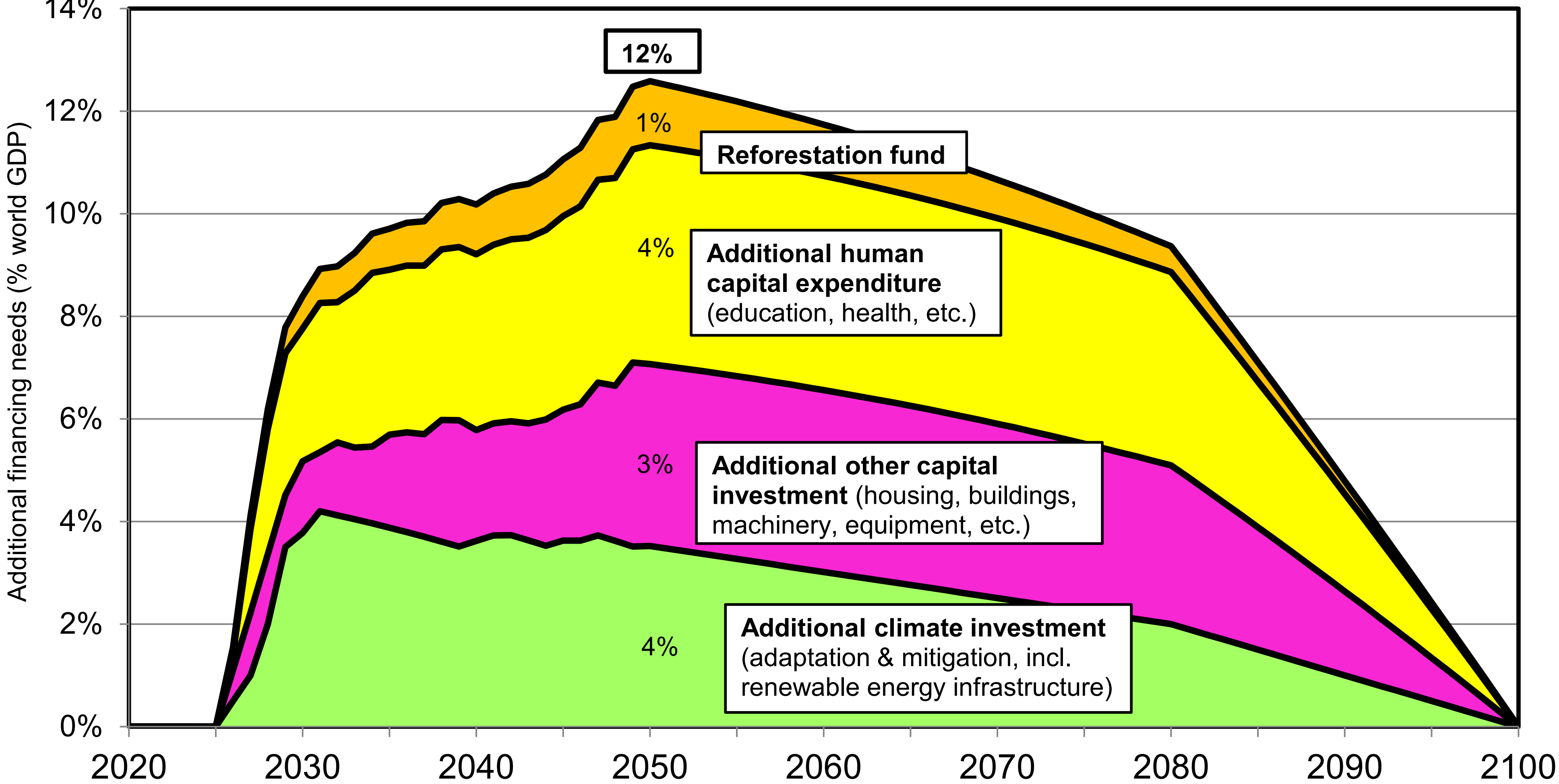

**Interpretation**. The Sustainable Convergence (SC) scenario leads to lower per capita GDP than other scenarios in 2100 but to higher well-being, once we include the value of extra free time (leisure) and a lower-bound estimate of the value of planetary habitability, as measured by the impact of lower temperatures on subjective well-being and output. This ignores potential catastrophic climate events and tipping points, which are nearly impossible to value in monetary terms. **Sources and series**: wseed.world (R1a)

## Fig. 51b. Sustainable Convergence: Higher Well-Being in All Regions in 2100, Even Without Climate Tipping Points



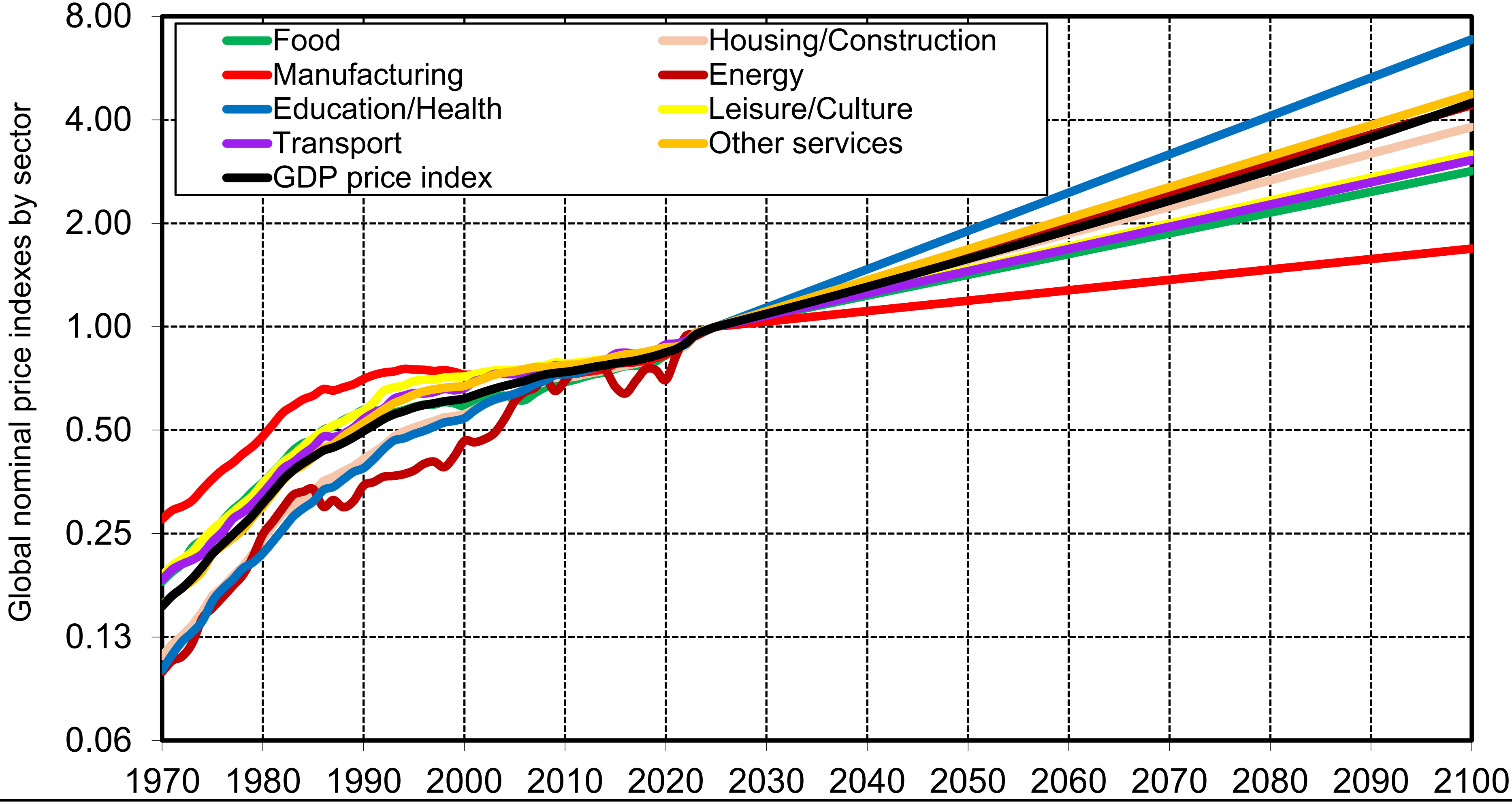

**Interpretation**. The Sustainable Convergence (SC) scenario leads to higher augmented per capita GDP (comprehensive well-being indicator, including value of extra free time and planetary habitability) than other scenarios in all world regions in 2100. However the gap is relatively small for the world's richest regions, & can even turn negative for some countries during the transition period 2025-2100. This ignores potential catastrophic climate events and tipping points, which are nearly impossible to value in monetary terms. **Note.** NAOC: North America/Oceania. LATAM: Latin America. SSAF: Subsaharan Africa. RUCA: Russia/Central Asia. EASA: East Asia. SSEA: South & Southeast Asia. **Sources and series**: wseed.world (R1b)

# Fig. 52. Sustainable Convergence Scenario: Total Additional Financing Needs 2025-2100 (% world GDP)



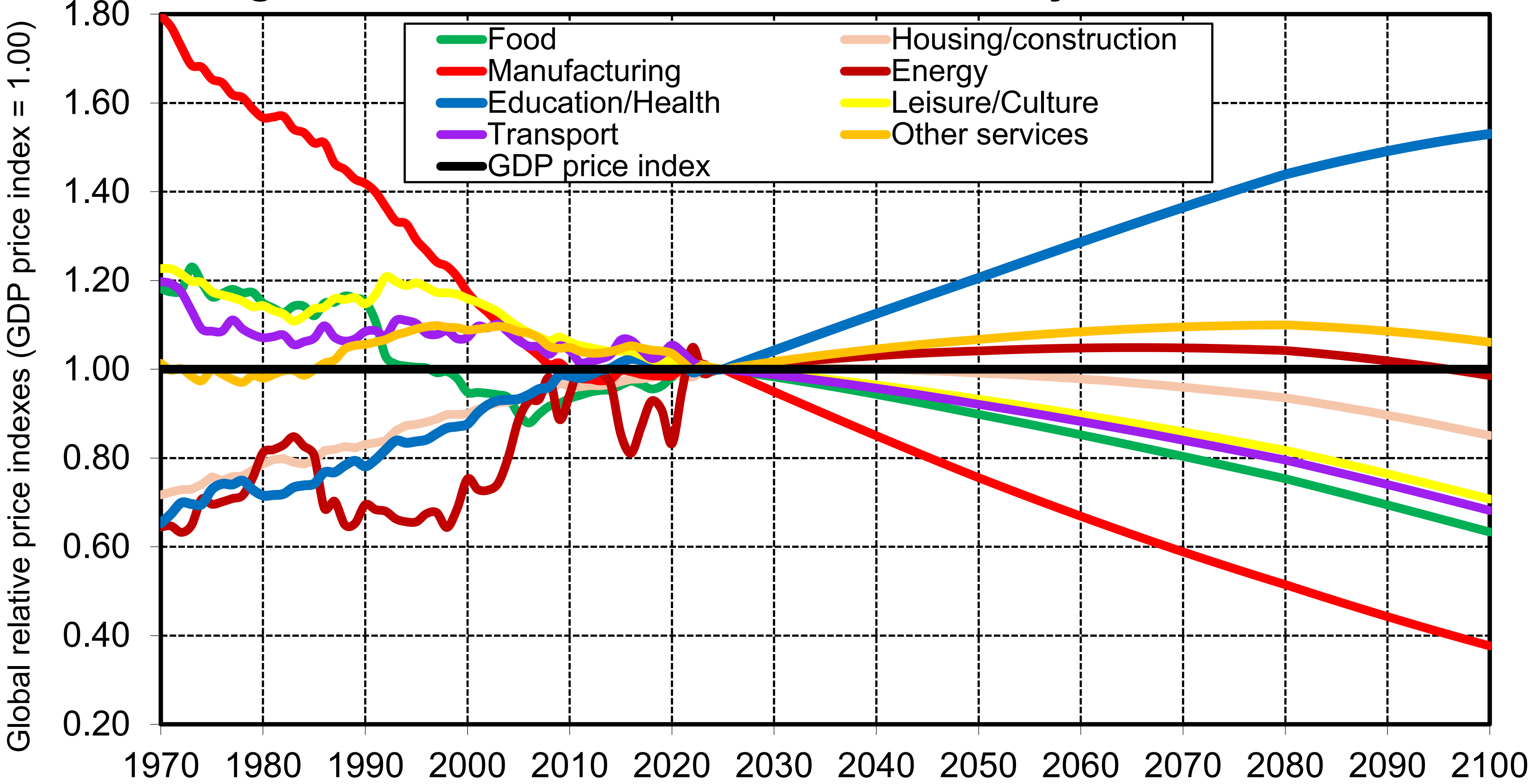

**Interpretation**. According to our projections, the Sustainable Convergence scenario requires total additional financing for capital investment, human capital expenditure and reforestation fund around 12% of world GDP by 2050 (as compared to Persistent Inequality or Productivist Convergence). Additional financing needs around 2030-2060 are projected to vary from about 3-4% of GDP in Europe/North America up to about 15-20% of GDP in Subsaharan Africa/South & Southeast Asia. **Sources and series**: wseed.world (Jx0)

## Fig. 53a. Global Nominal Price Indexes by Sector 1970-2100




**Interpretation**. GDP price inflation has been 3.6% per year on average at the world level between 1970 and 2025 and is projected to be 2.0% over the 2025-2100 period. Inflation has always been lower in material sectors than in immaterial sectors (e.g. in manufacturig sector vs education/health), due to differential rates of technical change and is projected to follow the same pattern in 2025-2100. **Sources and series**: wiseed.world (C0a)

# Fig. 53b. Global Relative Price Indexes by Sector 1970-2100




**Interpretation**. Price inflation has generally been smaller in material sectors than in immaterial sectors, due to differential rate of technical change, and is projected to follow the same pattern in 2025-2100. In effect, the relative price of manufacturing goods has been almost divided by 2 over 1970-2025 and is projected to be divided by more than 2 over 2025-2100. This corresponds in both cases to a relative price effect of about 0.5-1.0% per year relative to general GDP price index. **Sources and series**: wseed.world (C0b)