

**2019 Global Sustainable Development Report (GSDR)
Independent Group of Scientists (IGS)**

Meeting and population and macroeconomics roundtable

**5-9 March 2018
Washington, DC**

The IGS met in Washington, DC, at the World Bank Group and the Center for Global Development, to advance the preparation of the report and to engage with outside experts in the fields of population and macroeconomics.

Key outcomes included

- Finalization of the report structure and section outlines (see Annex 1). IGS members committed to leading specific chapters/topics, and the Group agreed on a timeline for working toward a zero draft in time for the July 2018 IGS meeting (see Annex 2).
- Discussion of timing for 2018 IGS meetings: 8-12 July, New York (confirmed); late October in Asia (timing TBC, location possibly Indonesia)
- IGS requested that DESA/DSD take the lead on specific topics and to oversee coordination of the various contributions to the Pathways section. Chapter leads may also request DESA/DSD to engage in additional drafting based on annotated outline and storyline produced by IGS.
- Group endorsed the partnerships with outside institutions to prepare selected background papers.
- Request to DESA and other members of the UN Task Team to further evaluate contributions to the “Call for Inputs” and to propose the most relevant contributions to the chapter leaders for incorporation into the zero draft.
- Support expressed for outreach plans, including opportunities for exchange with stakeholders at the regional level, three webinars in 2018, and a blog series
- Initial agreement with general approach to a peer review process. Procedure will be recirculated to group for final approval.

Summary of meeting

After brief welcome remarks by the co-chairs and the World Bank hosts, the IGS addressed the progress made on the preparation of the GSDR, section by section. The overview below provides background to the detailed outline document contained in Annex 1.

Introduction

The Introduction will be the space to lay out not only the structure and narrative arc of the report but also to present the values in which the GSDR is rooted—a commitment to equity between and within countries, the understanding that there are decisions that need to be made urgently to preserve the world for future generations, and a commitment to achieving social thresholds and true human wellbeing without transgressing biophysical boundaries.

The independence of the IGS allows the report to make bold statements, and Group members are committed to leaving their individual comfort zones behind. They reaffirmed that this is not only a “science report” but a tool for implementation of the 2030 Agenda—one that will speak to policy makers and to the science establishment itself. The GSDR will encourage science to set research agendas that will address gaps in knowledge and also to use existing knowledge more effectively to advance sustainable development (including through “sustainability science”).

IGS members emphasized the need to keep human wellbeing at the center of the report, and acknowledged that developed and developing countries sometimes approach sustainable development from different angles—for example with the issue of planetary boundaries and sustainable consumption and production resonating with developed countries, and poverty reduction remaining as the starting point for developing countries. The GSDR should therefore choose its approach and vocabulary carefully—maybe talking about limited resources is preferable, for instance, to the concept of “planetary boundaries.” It will also be important to emphasize inter-connectedness, not only of the SDGs but also of countries around the globe. Action by one country will not be meaningful without global action.

At the same time, the report must look realistically at the need for tradeoffs (in the food systems, for instance) in order to meet the SDGs and the Paris Agreement. Human adaptive capacity is also relevant in this context. Graphical representations—similar to the 2005 human footprint vs. HDI image—will be useful here.

The IGS discussed the need to address the progress of individual SDGs and to devote some analysis to the “off-track” Goals and targets, noting that the Secretary-General’s Progress Report can serve as the foundation for this analysis. In this regard it will also be important to address challenges in monitoring and data, especially for countries in special situations and other developing countries, and also to consider indicators that are currently inadequate, too vague and politically (rather than scientifically) defined and where there are no viable proxies.

Means of implementation will need to be addressed—including ODA, innovative financing, engagement with the private sector, and technology (e.g. negative emissions technology) which can ease tradeoffs or advance synergies.

Transformations

Research assistants for the working group are carrying out an “assessment of assessments”—26 reports reviewed so far—looking at the interactions described in these reports and mapping them using the ICSU seven-point scale. A total of 723 interactions have been assessed (548 positive and 158 negative). It is instructive to see what parts of the Agenda have received the most attention and which parts have been relatively ignored.

IGS members highlighted the importance of distinguishing between interactions that occur in through a mechanistic causal relationship (e.g. the relationship between climate change and sea level rise) and those that are due to integrated policy actions. It will be important in the Transformation section to lay the groundwork for the Pathways section, explaining the prioritization and how the topics were chosen for further elaboration. Important to understand and communicate that the chapter maps the *current understanding of* interactions (rather than the objective nature of interactions).

In discussing the second Transformations section—on governance—the IGS emphasized the distinction between government and governance, more broadly. They also felt that policymakers would be more receptive if this section speaks in the vocabulary of SDG 17—on the means of implementation—finance, trade, capacity building, technology, etc.

The IGS stressed that currently, governance structures are not adequate for truly integrated decision making—budget lines and ministries still operate in silos. Without a coherent framework for global governance, managing the world’s limited natural resources is more challenging and has to be accomplished through existing global structures, such as those for financing. In this context it is necessary to acknowledge that the globe is “hyper-connected” but also that some countries are excluded from the system.

The IGS discussed the importance of distinguishing between areas where incremental change is sufficient and where transformational change is needed (e.g for de-carbonization and reducing income inequality). Resilience is a positive quality until it stands in the way of making the necessary sweeping changes. Some systems are *too resilient*, i.e. not prone to change even when transformation is needed. In all discussions, it will be crucial to make clear the desired end point—the goal of the transformation as outlined in the 2030 Agenda and beyond.

In the context of the individual empowerment and behavior chapter, the IGS agreed that it will be important to explore the reasons why transformation doesn’t occur—including economic interests, cognitive state, or habits. The report should thus address issues of education,

including life-long education, building capacity for productive engagement, behavioral economics, and cognitive science.

Pathways

Members suggested that to be featured in the Pathways section, a topic should (1) be relevant to policy makers, (2) address not only the systemic but also the behavioral level, (3) touch on more than one SDG, (4) illustrate a transformation of practices, (5) address transversal topics (gender, capabilities, role of science, tech and innovation) and (6) have a demonstrable impact on poverty eradication and improving human wellbeing. The cases need to distinguish between anecdotal evidence vs. a higher standard of scientific evidence.

The final list of topics is contained in Annex 1, but the discussion highlighted additional principles to keep in mind as the Pathways section is developed.

- Specific country cases can illustrate the pathways, and island states may need particular coverage in the report (the GSDR mandate includes mention of countries in special situations).
- It will be important to link to the Pathways narratives to relevant off-track SDGs.
- Equality is a transversal issue, and the cases should emphasize social issues—gender equality, obesity, social inclusion, and links between the financial system and multi-dimensional poverty.
- The role of the private sector is important and should be prominent in this section.
- Labor mobility can be featured in various contexts as having a positive impact on sustainable development.
- The Call for Inputs can provide useful cases for this section.

Role of Science

A revised structure for the Role of Science section has been proposed and is included in Annex 1. In addition, the discussion raised a number of issues relating to the process, the substance and the style of the section.

The IGS noted that the section should highlight how science can help implement SDGs and how, simultaneously, the SDG framework can improve the scientific endeavor. In this regard, it is important to acknowledge that inputs of science to SDG debate are fundamentally different

from other kinds of inputs. The GSDR could remind policy makers that in many cases the scientific knowledge already exists and needs to be deployed.

There are many fields where there is a clear case for more investment (e.g. medical innovation), and these should be highlighted. Science- policy dialogue should be institutionalized in every country. Science (defined broadly) can be presented as an antidote to ‘fake news’, and as an argument in favor of open data as well as brokering institutions. There need to be changes in science if we are to take the SDG interactions seriously—including the need to change incentives on how people make science. There is a need for more inter-disciplinarity and greater participation of other stakeholders.

Members noted that it will be important to refer to earlier assessments on SDGs and to use accessible language, understood by government officials and relevant to policy-making and budget allocation decisions. The recommendations and key messages presented by scientific advisors while Member States were developing the SDGs could be instructive in this area. Members emphasized that the value of basic science should be highlighted in the report.

The IGS reaffirmed that while the GSDR concentrates on science for the SDGs, the knowledge of indigenous peoples that is relevant to the SDGs is also important. (Members noted that local and traditional knowledge exists in both in developed and developing countries.)

Beyond the Goals

This discussion addressed both the topics that have been identified as being “beyond the SDGs” and the mechanics of how to handle them. Topics included:

- Population trends
- The risks (and benefits) of technological advances including artificial intelligence and others
- Security, conflict, military expenditures (maybe discuss in terms of seeking stability)
- Animal welfare, and ethics more broadly.

Different options for approaching this section were discussed. A standalone chapter, or a series of “branded” text boxes spread throughout the report, or integrating the topics into the main narrative in the Transformations and the Pathways sections. After the session on Day 1 and additional bilateral discussions, the IGS decided to incorporate the Beyond the Goals issues into the other sections, using text boxes when appropriate but also by integrating into the main narrative.

Conclusion

The IGS used this session to develop an immediate term plan for revisiting the section frameworks over the following two days, to present a concrete way forward for each section in the wrap up meeting on Friday.

Outreach

This session addressed the evolution of outreach efforts—moving from collecting input to trying out key messages—as well as specific opportunities to engage with stakeholders over the next 12-18 months. Additional points on outreach were raised during the 9 March wrap up meeting, but they are all compiled here for ease of reference.

The IGS discussed the need to bring a range of constituencies into the process, moving beyond the academia to include the private sector, civil society and government officials. It may be important to employ different approaches for these different groups, and further thought is needed on how to engage the private sector in particular. DESA offered to connect with WBCSD and Global Compact as needed.

The IGS reiterated the need for exchange with all regions, and it was agreed that at minimum there should be a meeting in Africa (South Africa, May 2018), Latin America and the Caribbean, and Asia. Further information on the Seedbeds conference in South Africa will be circulated separately.

The location and timing for the meetings in the other two regions are still to be finalized, but see attached timeline for provisional plans. The attached timeline also includes dates for the next exchange with Member States at UNHQ in New York, as well as a planned symposium at Cornell University on the science-policy interface.

The IGS agreed that in addition to in-person meetings, web-based outreach will be important. DESA will organize a series of webinars to allow the IGS to communicate directly with Member States, to help establish an on-going dialogue and to hear initial feedback from delegations as the report progresses.

The IGS also noted that a template Power Point presentation would be a useful starting point for members giving talks at various events. See a draft Power Point template attached.

IGS Members will draft blog posts over the next 18 months, to be featured on the DESA website.

The Call for Inputs was an important tool for soliciting contributions from the broader academic community. The UN Task Team will review and evaluate the submissions by late April, keeping in mind the scientific as well as the policy value of each contribution.

At the end of the session, the IGS discussed the best way to engage with other assessments currently underway—including the GEO 6, IPBES and others. UNEP is encouraging a formal

collaboration among the co-chairs of the various reports, and DESA will continue to keep the GSDR co-chairs aware of progress in this regard.

Peer review process

DESA presented a proposal for a quality assurance process to the IGS during the wrap up meeting, and after hearing feedback from the IGS, DESA will revise and re-circulate the proposal.

Roundtable on Population and Macroeconomics

Opening session

Juergen Voegele, Senior Director, Agriculture Global Practice

Dr. Voegele welcomed the IGS and other guests, reminding the group that the World Bank Group's mission is sustainably eliminating poverty—a particularly important priority because inequality is on the rise.

Dr. Voegele emphasized that food systems must change in order to accomplish the SDGs and the climate goals. Food related emissions are still on an upward trajectory, and unlike in the fields of transport and energy solutions are not readily available. If the world continues in a business as usual scenario, 70% of GHG emissions will come from food by 2050 (already, wasted food accounts for 8% of global emissions).

Dr. Voegele noted the many structural challenges—of the \$580 billion annual agriculture subsidies, most of this money goes to 5 or 6 crops (vegetables are not subsidized). In turn, people's health suffers, and 1/2 of the world's population is mal-nourished (either hungry or obese), and non-communicable disease related to food are rapidly rising as a major cost in global health systems.

There is much insecurity in the food system—the world has 3 months of food supply, and when food stocks fall (after a crisis, or when biofuels are popular, for instance) price volatility increases. In addition, the next 3 billion people that will be added to the population will be born in food insecure places. So, while there is a drive toward increased local foods in some areas, this will not be possible in the 40 or 50 countries that cannot feed themselves.

Change will be difficult if the subsidies in certain crops and fertilizer continue, and it is politically difficult to end the subsidies. But some governments have had success in transforming subsidies into new types of incentives (incentivizing farmers to expand the Holstein genetic makeup to reduce methane released, for instance, or incentivizing farmers in India to use less fertilizer).

Session 1

Panellists:

- **Wolfgang Lutz, Founding Director of the Wittgenstein Centre for Demography and Global Human Capital, IIASA**
- **Samir KC, Prof at Shanghai University**
- **Brian O’Neill, Leader, Integrated Assessment Modelling NCAR**
- **Marianne Fay, Chief Economist, SD**

Moderator: Amanda Glassman

Dr. Lutz discussed the fact that population growth makes it more difficult to reach health, poverty, education goals in the 2030 Agenda and that climate change coupled with population growth may lead to conflict. Demography—the scientific study of changing population size and structure, including place of residence, education, ethnicity, marital status, employment, etc.—sheds light on the strong link between levels of education and fertility. While the Preston Curve—tracking income and life expectancy—is well known, in fact the connection between life expectancy and education is stronger.

Dr. Samir KC shared that the population of Asia will peak at 5.2 billion in 2050-2055, and that population will age by 2030 and the number of children will decline. The education profile of the population is changing over time. Now, 1.23 billion of adult population (37%) of population has less than secondary education, and some countries have 80% with incomplete lower secondary (Yemen, Afghanistan, Cambodia, others). These trends are changing, but still, large investments will be needed to achieve SDG 4—business as usual is not sufficient.

Dr. Brian O’Neill presented an analysis of the climate change related risks to people and ecosystems—characterizing the risk as a combination of hazards, vulnerability and exposure. Exposure to sea level rise, extreme weather, disease, etc, is increased by a population’s vulnerability, which is based on the characteristics of people (age, education, income, food). Risk is driven by societal change more than climate change, and by focusing on this social dimension, researchers can illuminate the link between climate action and the SDGs. The STIRPAT model shows that population growth and emissions rise at roughly the same rate. Education can have opposing impacts on emissions—lower fertility but higher economic productivity—but the model shows that the economic productivity is more influential (so on balance, emissions rise).

Ms. Marianne Fay opened the discussion, noting that the SDGs—framed in terms of human rights—must take an integrated approach that works simultaneously for social and environmental benefits. Grow first, clean up later is not viable, and this is an important message that the GSDR should convey. She recommended that the report focus on irreversibility and the local and immediate benefits—as well as the current risks including

pollution, children's health, etc. One more coal fired plant is reversible—a poorly planned city or cutting down an old growth forest are irreversible. The report should also be honest about what are the tradeoffs and the co-benefits of policy choices.

IGS members agreed on the importance of framing issues correctly—for instance, education and women's empowerment are not just the means to the end of lowering birth rates but rather are ends in themselves. Access to contraception is an important piece of the solution, but there are many social interventions that can be effective, and policy makers need to understand what is the waterfall of benefits. Level of education, quality of education, urbanization, labor force participation are all important factors, but perceptions are also critical. In some countries, people base their decisions—whether to stay and invest in their home countries or to try and migrate—on their perceptions, their optimism about the future.

IGS members highlighted the importance of robust disaggregated data, including on income, in order to tackle inequality. Policy makers are building for the most likely future—but if the likely future doesn't happen then the solutions are fragile. Projections and probabilities are being upturned by climate change, so policy makers need more versatile and robust plans and policies based on data.

Session 2

Inequality within and across countries: trends and solutions

Panellists:

- **Jesse Ausubel, Director and Senior Research Associate of the Program for the Human Environment of Rockefeller University (vc)**
- **Francisco H. G. Ferreira, Senior Adviser, Development Research Group, The World Bank**

Moderator: Eun Mee Kim

Dr. Ausubel described the transformative potential of technology. Traditionally there have been four types of resources: (1) natural resources, (2) labour, (3) capital and (4) technology. Now, advancements in technology make natural resources and labour less important, so the damage to the environment can be minimized. (e.g. autonomous cars, smart buildings, precision farming). In general, terrestrial ecosystems have benefitted more from technology than marine ecosystems have. (To protect the ocean, people need to change consumption patterns or increase aquaculture.) The impact on labor will be a challenge, as the same technologies that are beneficial to natural resources may be detrimental to jobs and inequality. In terms of labor, technology will likely reinforce the trend toward less work (and lifespans are lengthening at the same time).

Dr. Ferreira presented large scale trends in global poverty, highlighting that there has been great progress in the past two decades, especially in East Asia. But the poverty that remains is concentrated in places that are harder to reach, particularly in sub-Saharan Africa. These areas either have failed to grow or else the growth has not translated into poverty reduction. When growth is more inclusive it has a higher impact on poverty reduction. Dr. Ferreira noted, however, that inclusivity and inequality may not be fully represented because the top incomes are not well captured in household surveys.

In the discussion that followed, IGS members questioned whether the highest income brackets are important to consider, though there was agreement that do have an impact on the *perception* of inequality, which can then lead to fraying social fabric. It also matters whether the same people and groups are consistently remaining at the bottom of the economic ladder. Intergeneration mobility is very much related to the perceptions of inequality as well.

Members returned to the idea that in the GSDR, treatment of the potential negative outcomes of technology should be balanced with acknowledging the benefits. The effects—positive or negative—of technology depend on governance to a large extent, and at the same time, new approaches to governance are enabled by technology.

The IGS agreed to look at models and explanations for the trends in inequality, noting that income inequality across countries has reduced in global terms but that much of the reduction is related to progress in China. Additional factors include

- Governance is instrumental in ensuring that economic growth translates to poverty reduction
- Extreme income poverty is becoming concentrated in some countries, and these countries have weaker institutions.
- One of the effects of high wealth concentration is that it can be self-perpetrating given political power inequality
- Many places in which poverty is becoming concentrated are where the impact on environment would be high.
- Leapfrogging will be needed in production but also in consumption.

The discussion then turned to the importance of timely data, and the challenge that many face in access to data. India and China are supplementing household survey data with other sources, including satellite information. In developed countries, tax return data is reliable but this is often not the case in developing countries.

Session 3

Economic instruments for transitioning to sustainable development

Panellists:

- **Lant Pritchett, Professor of the Practice of International Development, Kennedy School, Harvard (vc)**
- **Partha Mukhopadhyay, Center for Policy Research, India**
- **Charles Kenny, Senior Fellow and the Director of Technology and Development at the Center for Global Development**
- **Joao Pedro Wagner De Azevedo (JP), WBG Lead Economist & Global Lead, Poverty Global Practice**
- **Muthukumara Mani, WBG Lead Economist, South Asia Office of the Chief Economist**

Moderator: David Smith

Dr. Mukhopadhyay began by providing an overview of sustainable production and consumption issues, covering topics from waste to tourism, using the lens of India. He described how India is working to phase out fossil fuels subsidies, encourage biomass, and to shift fertilizer subsidies to encourage more organic fertilizers. He illustrated the fact that countries and regions naturally set priorities: in India, SDG 12 should address scrap and recycling (which is a strong informal sector in India); SDG3 will require massive increase in health insurance for the poor; efforts to cease open defecation need attention; cash transfers and other tools are closing the gender gap in school; and rural/urban divides are not always clear.

Dr. Kenny then introduced two papers. One looks at scenarios and analyzes those countries that are the success stories—beating the human development predictions that would usually arise from their income level. He concluded that technology and income growth are more important than policies and budget allocation (governments and outside partners are already spending more than ever before). He acknowledged that there are some questions about the quality of the data in some of the outlier countries, but they can still be instructive.

Dr. Wagner De Azevedo presented concepts of wellbeing, noting that though global poverty has never been lower, persistent pockets of poverty remain, and there are ongoing challenges to true understanding of multidimensional poverty. Definitions of multidimensional poverty are based on consumption patterns and do not include environmental factors, and in the future remote sensing will allow more granular understanding of reality. Still, household surveys are important sources of data and should be continued and strengthened.

Dr. Pritchett stated that an exploration of sustainability should start by acknowledging that Malthusian predictions failed as they ignored changing elasticities of substitution in consumption and production. At the same time, the last century has seen unprecedented improvements in human well-being and so concern about environmental costs should focus on areas where such beneficial kinds of substitution are either not technologically possible, or incompatible with current incentives. . He also argued that often, predictions about risks ignore the most threatening risks which may appear unlikely but have catastrophic consequences. It is difficult to convince people to change consumption when a resource is plentiful and the market

price is low. When it is important to change, measured governance is needed. Otherwise, one has to wait until the market provides incentives for the necessary innovation.

Dr. Mani described World Bank efforts to incorporate climate impacts into their program decision making, using impact assessments of investments projects and development loan decisions. A climate screening has been in place for a while but now the Bank is working to move beyond the “do no harm” approach into something more mainstreamed and central to the projects. He noted that thus far there has not been sufficient uptake of green accounting—and that when policy makers do employ green accounting, the focus is on extreme events, even though slow changes may be more significant in the long run.

In the discussion that followed, the IGS asserted that the GSDR would need to include strong scientific evidence on the irreversibility of environmental degradation—in terms of climate change, biodiversity loss, etc. At the same time, the social aspects of development are paramount, so human wellbeing must be the first priority. The report would do well to present the world as a system of systems—where plenty of substitution happens, but this substitution often exacerbates existing inequality. There may be space to address alternative measures to GDP in transformations section of the GSDR.

Dr. Pritchett argued that by every measurable dimension of human wellbeing (e.g. education, health, poverty), the last 60 years have been a success. Most countries have succeeded in poverty reduction through integrating into the world economy, adopting production processes, selling what they could, and keeping a rough macroeconomic balance. He argued further that for environmental concerns, when prices are set correctly, countries do not need to explicitly follow green growth strategies. But participants pointed out that trade liberalization is generally not good for the environment.

As the discussion progressed, Dr. Kenny pointed out that the solution to income inequality is clear—taxation and redistribution—but it is politically difficult. He found that incentives must be culturally and politically acceptable. Cash transfer instruments have been successful, for instance, for achieving goals like advancing school attendance and reducing fertilizer use.

In terms of the unexpected risks—the IGS noted the relevance for any treatment of issues “beyond the goals” (i.e. increased use of antibiotics leading to antimicrobial resistance). The IGS also noted the importance generally of considering a wide range of risks, including pandemics.

The IGS acknowledged that the Kuznets curve argues that economic growth will ultimately reduce inequality. The IGS debated this, noting the ongoing inequality as discussed in the previous session. It may be that inequality is a bigger problem in rich countries, but the perception of inequality can have massive impacts (i.e. Arab spring starting in Tunisia, etc.), and can drive instability. The IGS also discussed links between policies to improve human wellbeing overall and those policies that target the farthest behind—in the context of the “leave no one behind” principle of the 2030 Agenda.

Once again, the discussion turned to the importance of strong, open data. Currently the tools and platforms to utilize open data missing in many countries. Members noted that new forms of micro data will be important and that traditional economic data, (i.e. GDP, etc) is not enough.

Session 4

Macroeconomics and sustainable development: other considerations

Panellists:

- **Luiz Carlos Bresser Pereira, Emeritus Professor of Getulio Vargas Foundation in Brazil and former Finance Minister, Minister of Federal Administration and Reform of the State, and Minister of Science and Technology of Brazil (vc) ·**
- **Denny Lewis-Bynoe, WBG Senior Economist, Country Economics and Engagement, IFC**
- **Marcelo Giugale, World Bank (Director, Economic Policy and Poverty Reduction Programs, Africa Region)**
- **Michael Toman, Manager for Energy and the Environment, Development Research Group, WBG**

Moderator: Parfait M. Eloundou-Enyegue

Dr Lewis-Bynoe discussed imperatives for building resilience, from the perspective of small island developing states (SIDS). She presented a framework for measuring vulnerability (using measures beyond GDP and including the environmental risks faced by SIDS). Governments and partners need to consider all dimensions of vulnerability when making policy and financing decisions. Dr. Lweis-Bynoe also highlighted the key role that the private sector must play in achieving the SDGs.

Dr. Giugale discussed a number of World Bank instruments that are raising money for environmental protection—green bonds, gender bonds, and other “branded” bonds. One challenge is the need to demonstrate that these bonds will increase the expenditure in these areas (i.e. that they do not support projects that would have happened anyway). The World Bank has started to sell natural disaster insurance as well, and these insurance instruments have become very popular. The Bank also offers asset management services, and though the Bank does charge a fee, but it uses the fee for institutional capacity building in the country

Dr. Toman discussed a range of economic policy instruments, including the carbon tax and offset mechanisms, and reflected on how can they contribute to the SDGs. These instruments are needed when the market does not recognize the full (including non-monetary) value or cost of something, and they work by creating incentives and targeting the bad. He argued that cost

benefit analysis is sometimes insufficient, and that it may be necessary to use a more holistic analysis when determining the desired limits for carbon emissions, water pollution etc.

Dr. Bresser Pereira discussed the challenges that developing countries face when trying to industrialize, particularly if they rely on the export of commodities and their currency is overvalued. The countries that have succeeded in developing in the last 50 years (South Korea, Singapore, Taiwan) all have one thing in common—they do not have natural commodities, so did not suffer from the “Dutch Disease.” The Dutch Disease is the negative impact on an economy of anything that gives rise to a sharp inflow of foreign currency, such as the discovery of large oil reserves. The currency inflows lead to currency appreciation, making the country's other products less price competitive on the export market. Brazil, earlier in its process of industrialization, had neutralized the Dutch Disease by imposing high tariffs on the import of commodities and subsidizing the export of manufactured goods. Characteristics needed for growth:

- Exchange rate should be competitive
- Wage rate should grow with productivity
- Inflation rate should be low
- Profit rate must be satisfactory for enterprises

Dr. Bresser Pereira argued that green growth is necessary to protect the environment, because, for instance, climate change efforts need capital.

In the discussions, the IGS approached some of the arguments from panellists from different perspectives. They questioned, for instance, whether governance is actually the most important factor for countries facing severe environmental challenges. They also raised the fact that some have suggested a zero discount rate across generations, but in the context of climate change, policy makers must compare the costs of investing in adaptation and mitigation which delivers results in decades later.

The IGS also highlighted the moral hazards when dealing with catastrophic risk insurance—questioning whether it is better to work to protect against catastrophe, rather than to place a value on the risk. The IGS asked about the political ramifications of devaluing national currency, and Dr. Bresser Perrera acknowledged that the approach is politically difficult, because when currency depreciates, wages decrease and wealth is lost. Finally, the discussion turned to the challenges around valuing ecosystem services—a problem that has not yet been satisfactorily solved.