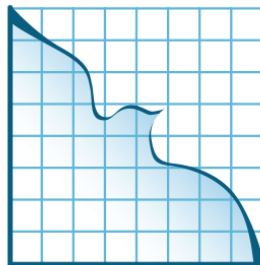


**ECONOMISTS for
PEACE & SECURITY**

**Nature Counts
Accounting for the Environment in National Statistics**

Friday, Jan. 6, 2023: 10:15 AM - 12:15 PM

- Dr. Linda Bilmes, Harvard University (Moderator)
- Dr. Bert Kroese, Chief Statistician, International Monetary Fund
- Dr. Joseph Stiglitz, Columbia University
- Dr. Eli Fenichel, White House Office of Science and Technology Policy
- The Hon. Mauricio Rodas, Former Mayor Quito, Ecuador



Nature Counts: Accounting for the Environment in National Statistics ASSA New Orleans Panel Session

Linda Bilmes: Good morning. I am Linda Bilmes, Co-chair of Economists for Peace and Security. I am the Daniel Patrick Moynihan Senior Lecturer in Public Policy and Public Finance at the Harvard Kennedy School, and for the past seven years, I have been served as the United States member of the United Nations Committee of Experts on Public Administration, where I chair the working group on Climate Change. Wearing all those hats, I am delighted to welcome you here today.

Economists for Peace and Security is a group of experts in economics and related fields dedicated to world peace and economic justice. It was founded by Kenneth Arrow, Lawrence Klein, Robert Solow, Robert Schwartz, and Barbara Bergman. From the beginning we have interpreted our mission broadly to include not only nuclear disarmament but also preventing the root causes of conflict, including social equity, economic fairness, access to healthcare, and protecting the planet.

The group of individuals who have been involved as trustees of Economists for Peace and Security includes some of the finest minds in these fields, including Nobel laureates Amartya Sen, Daniel McFadden, Eric Maskin, Roger Myerson, Oscar Arias, George Akerlof, Joseph Stiglitz, Robert Solow and numerous prominent thinkers including Sheila Bair, Jason Furman, Robert Reich, George Papandreou, James Galbraith, Sir Richard Jolly, and many others.

This panel today is focused on a puzzle, and an understudied intersection between economics and the environment. And the puzzle is that governments and multilateral institutions devote an enormous amount of effort to collecting data and statistics and rely on those statistics. And yet, our basic economic metrics like GDP do not reflect the condition of natural assets like air, water, soil, insects, that make life possible in the first place.

This deficiency in basic economic data makes it easier to deplete the natural world – as we see all around us -- and makes it harder to measure the true economic and social condition of any country. Yet we know that it is possible to incorporate the value of environmental assets and the ecosystems they sustain into national statistics. And our panel today brings together four leading experts on this subject who can tell us not only how to revise national statistics, but why it is essential to do so.

Bert Kroese is the Chief Statistician and Data Officer and Director of the Statistics Department at the IMF. Before joining the Fund, Dr. Kroese worked for 25 years at Statistics Netherlands, where he was an innovator in many fields. And in particular, Bert has chaired the UN Committee that helped establish the System of Environmental Economic Accounting (UNCEEA) which has become the gold standard for governments to include the values of environmental and ecosystem services into national accounts. And so, we are delighted to welcome Bert.

Eli Fenichel is a Professor of Natural Resource Economics at Yale who works on a wide range of natural capital systems from tropical forests to fisheries. He is currently on leave from Yale and serving in the White House Office of Science and Technology Policy as Assistant Secretary for Natural Resource Economics.

And what has happened under Eli's watch over the past year is rather extraordinary because until this administration, the US was lagging badly in the global effort to revise economic statistics for natural capital. In just a few months, Eli and his team produced an ambitious and exciting plan to make dramatic changes in how we account for natural capital in US statistics and have launched a government-wide effort to do this.

One of the features of panels at Economists for Peace and Security is that we also convene leading practitioners who bring actual on-the-ground experience to these discussions. Mauricio Rodas is the former mayor of Quito, Ecuador, and he is an impassioned advocate for climate actions in world cities. Mauricio has been a world leader on this subject. As mayor, he hosted Habitat III, the UN's Conference on Sustainable Development, and he served as president of the C40 Cities Climate Leadership Group, The Global Covenant of Mayors for Climate and Energy, and a Young Global Leader of the World Economic Forum, a fellow of the Global Council of Cities and Urbanization and many other organizations. Mauricio has also worked extensively in Mexico and is a visiting scholar at the University of Pennsylvania. He also serves with me as co-chair of the working group on Climate at the United Nations Committee of Experts on Public Administration.

Finally, it is always a special honor to introduce my friend and colleague Joseph Stiglitz. As you are aware, Joe Stiglitz is one of the leading economists in the world. He has served as Chief Economist of the World Bank, as President of the Council of Economic Advisors; he has written more than 30 books, including co-authoring with me, *The \$3 Trillion War* about the cost of the Iraq and Afghanistan conflicts; he has received more than 40 honorary degrees; he is the winner of the John Bates Clark Medal in 1979 and the Nobel Prize in Economics in 2001.

One of Joe's perhaps the lesser known but extremely profound contributions is that for decades, he has been calling for reform in the way we measure economic performance. In 2009, Joe chaired a UN commission that proposed changing how we calculate GDP to include sustainability and human wellbeing. In 2010, he chaired an international commission on measuring economic performance in France that reached the same conclusion, and he currently chairs the successor to that group. And he has been, along with Amartya Sen, the world conscience around the fact that our economic statistics do not capture the underpinnings of sustainability and human wellbeing.

And so, I am delighted to welcome this amazing panel. Thank you very much for being here and welcome to all of you. We are going to start off with Bert Kroese who will lay the table for us. Thank you.

Bert Kroese: Thanks Linda, for the introduction and thanks for inviting me to this panel. Both through my previous job at Statistics Netherlands, my present position at the IMF, and as a former Chair of the UN SEEA, I have been involved in the field of National Capital Accounting [Chart 1] and I am glad to share my experiences.

This talk will be a mix of the experiences from these three roles.

Chart 1:

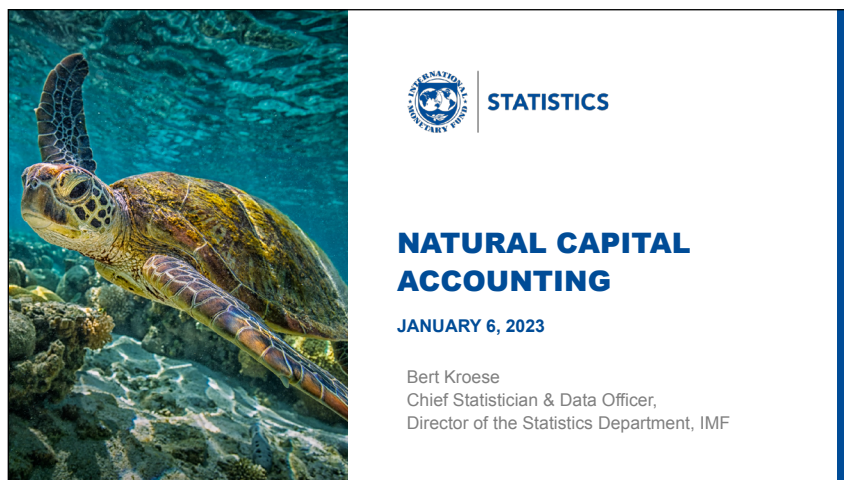
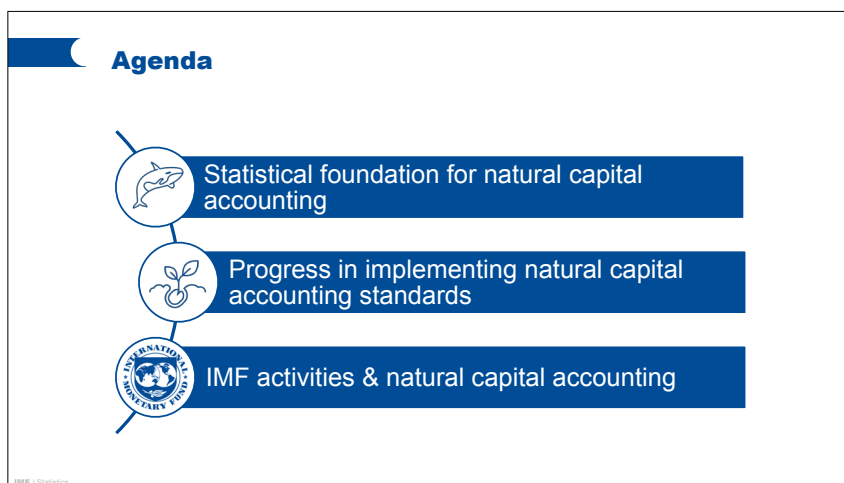


Chart 2:



I will talk a bit about the statistical foundation for National Capital Accounting, about the progress in implementing National Capital Accounting standards, and what is blocking progress. I will also say something about the IMF activities in this field.

Chart 3:

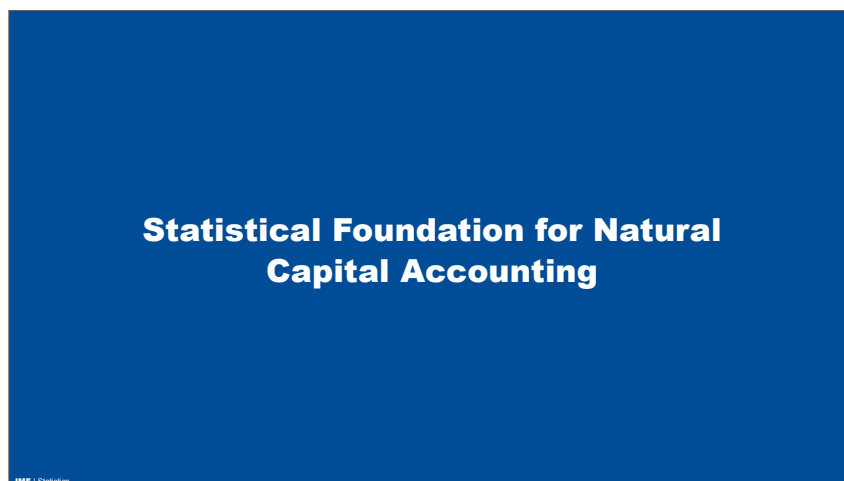


Chart 4:



I think most statisticians now agree with Joe Stiglitz that we should go beyond GDP. GDP is an important concept. It is based on the SNA, the System of National Accounts. This is a framework, a statistical framework, and it is important to have that because it means that the data are well-defined and well-understood and are internationally comparable. That is one of the reasons that GDP and economic growth have had a large role in many analyses. But it is also clear that measuring GDP is not enough. Many policy decisions have impact not only on the economy, but also on the environment and on society. We need to have insights on what the integral effects are of policy decisions. And so, we need integrated data on the environment, society, and the economy. I think the recent COVID crisis made it ultimately clear: you cannot just implement measures that block the transmission of the virus without looking at the broader effects. Measures may have immediate impact on the economy and on society. Policy decisions have impact on many areas and coherent integrated data is important. In this chart we see six more or less recent IMF blogs that illustrate that point. Policy makers need more data than just GDP.

Chart 5:



Linda already mentioned the system of environmental economic accounting (SEEA). The work on this was started long ago in recognition that GDP is not enough to base decisions on. Ten years ago, in 2012, the Central Framework (SEEA-CF), was adopted by the UN Statistical Committee. The UN Statistical Committee is the governing statistical body with all countries in the world being part of it. Once a year it meets in New York and decides on new statistical standards, like the SNA. And this SEEA central framework basically extends the SNA by systematically describing the natural inputs of economic activities and also the discharges and emissions of economic activities into nature. It also looks at the economic activities to protect the environment, and flows of individual natural assets like water and timber. The Central Framework is a structured way of describing the relation between nature and the economy using the same principles and classifications as in the SNA. Data based on SEEA can be used in various analyses that study the environment and the economy in an integrated way.

In 2021, the System of Ecosystem Accounting (SEEA-EA) was adopted as a new additional statistical standard. It deals with ecosystems which are combinations of living things with the natural environment that provide services. Examples are mangroves, peatlands, dunes, and oceans. The SEEA-EA system combines the ecological and spatial view on ecosystems with the economic view. It describes the ecosystem in a spatial way and its condition in terms of biodiversity, water and air quality etc. It also describes the services they provide to the economy and to humankind as a whole. This is about provisioning services, but this is also about flood protection, air filtration, clean water, etcetera.

In the ecosystem manual, ecosystem services are described in qualitative terms. There are also chapters in it about valuation, describing these same services in monetary terms. This is the hard part and there are still many discussions on it. This specific part of the manual is not a statistical standard yet and is adopted as 'internationally recognized statistical principles'. These principles are used for example my country, the Netherlands. We have made publications using it and other countries have too. But there is still discussion around valuation because how do you value things that are not on the market, like flood protection and air filtration. The good thing about both parts of the System of Environmental Economic standards is that they make the link between the environment and the economy. They use the same concepts, definitions, exchange value approach, and can be used to make an integrated description. They are used a lot to produce data. There are also all kind of application guides and special guides how to deal with energy, water, etcetera.

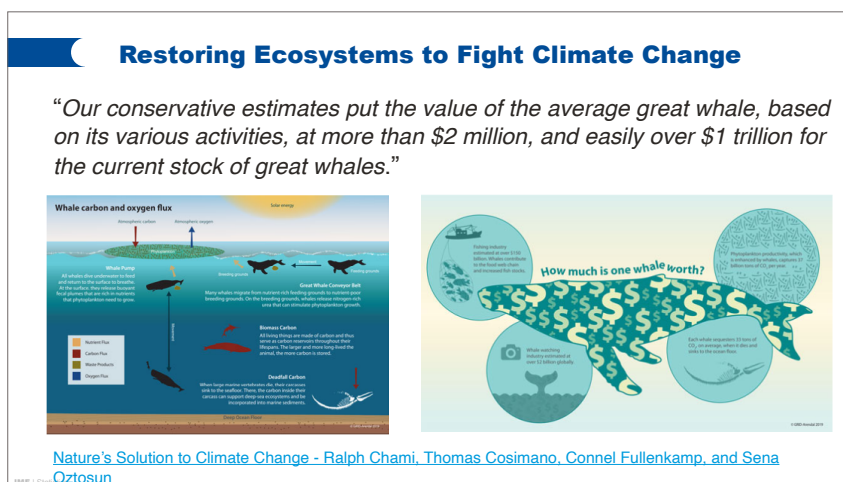
Chart 6:



So why do we need this kind of data? An example can be found in countries that have a lot of forests. Somewhat oversimplifying, they can cut down the forest, sell the timber, make the land into agriculture, and make a lot of money. But then they would lose the retention services of carbon and the tourism aspects. And it is important that if you make these policy decisions, you have an integral view of what you gain and what you lose. That is why describing the contribution ecosystem in an integrated way, according to national accounts concept, is so important.

At the IMF, climate change is high on our agenda. We see that it threatens long- term economic prosperity, welfare, and growth. And also in the shorter term, disruptions are caused by hurricanes and droughts. So, both in our surveillance work, policy advice work, capacity development, and also our statistical work, we do a lot. And our work in this area is growing. Last year, we introduced the Resilience and Sustainability Trust. It is a large fund that countries can borrow money from on concessional terms to do economic transformations, for example, those necessary because of climate change.

Chart 7:

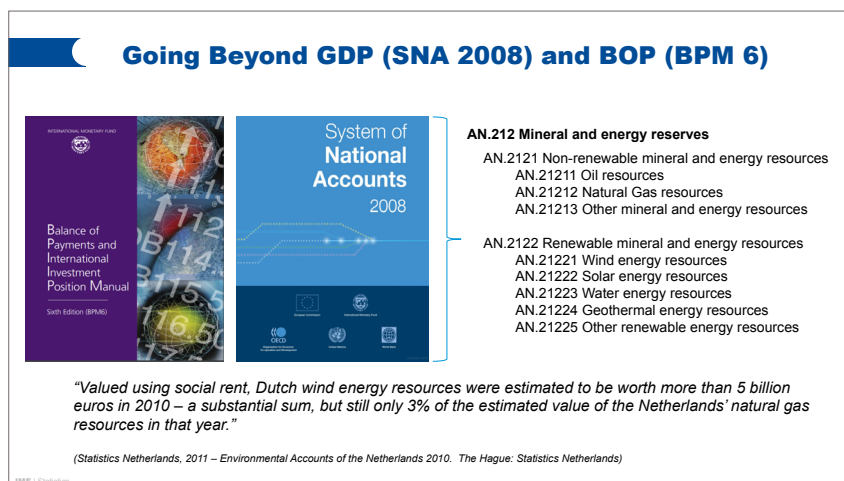


Here is another example of how a value can be assigned to the contribution of nature to the economy. I use IMF research of a couple years ago about great whales. They are beautiful animals and they have a value in themselves. We love the animals, but they also provide a measurable service to humankind. One service is obviously supporting tourism as people go on excursions to see whales. Whales additionally also play a large role in carbon retention. Whales are big animals. They store a lot of carbon, but they also stimulate growth of phytoplankton, which also results in a lot of carbon retention. And together, depending on the specific carbon pricing, the IMF research shows that every whale

is worth about \$2 million, and the current stock of these whales is valued at \$1 trillion.

Obviously you can discuss the specific assumptions and people do that. But the value of zero is wrong anyway. And if you have these numbers, you can discuss, for example, “Well, is it worthwhile to move shipping lanes because shipping collisions for whales are a big cause for death?” That costs money, but on the other hand you do not lose the value that the whales provide. So, this is the kind of information that these ecosystem accounts can provide.

Chart 8:



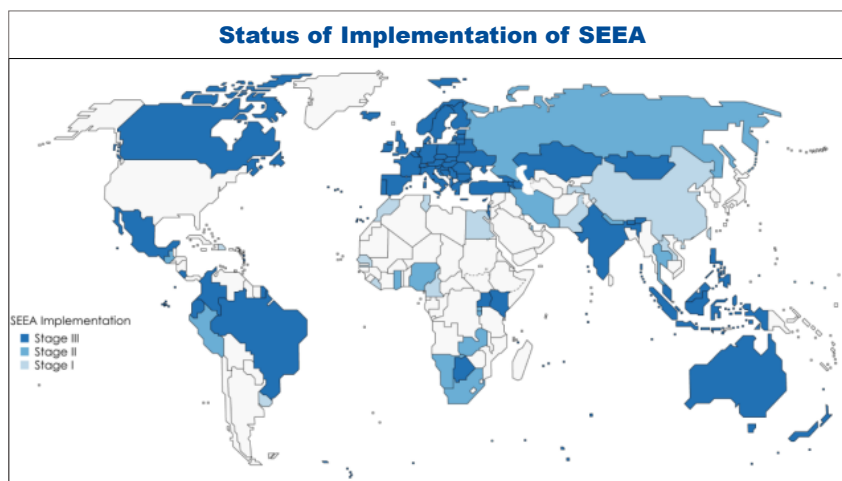
Not only are there relatively new systems in addition to the System of National Accounts, also that system itself is updated. About every 15 years, we revise the SNA and the Balance of Payments manual (about the external sector). In 2025, there will be a new version. The final decision on the SNA has to be made, of course, by the United Nations. The proposal now is that in the new system not only the oil and gas reserves will be included in the asset boundary, but also the renewable mineral and energy resources which is a big step forward.

And apart from that, we will be much more attentive to net measures. So not only gross domestic product, but also net measures that not only subtract depreciation from GDP but also the depletion of natural resources.

Chart 9:



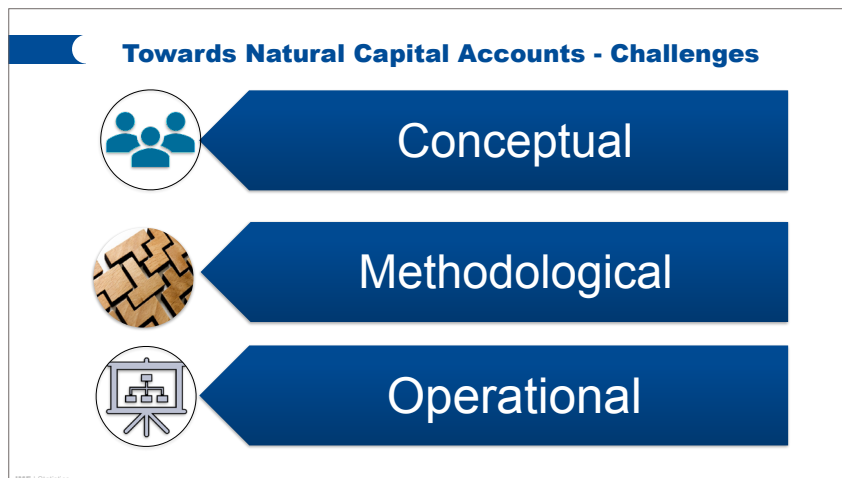
Chart 10:



So the good news is: there are statistical standards, they can be used, they are well defined, they are accepted by the global community, and they are well tested. In this chart (based on self-reporting) you can see that these standards are used in many countries in the world, but it is still very uneven and a lot of progress still has to be made. The dark blue countries publish data regularly. The middle blue countries produce environment economic accounting data on an ad hoc basis. And the light ones do it only experimentally. The white colored countries do not publish SEEA data at all.

Luckily, Eli, will tell us in the next presentation that in a couple of years the United States will have a different color. So, I am happy to hear that. And also, other countries will follow, but still the uptake is not as large as we would like to have it. About ninety countries are now producing these accounts.

Chart 11:



So what are the challenges? Why isn't every country publishing SEEA accounts? Well, there are conceptual challenges. Like I said, how do we value a service of nature that is not on the market? There are methodological challenges too. You need a lot of spatial information, satellite data. How do you use the satellite data to transform that into accounting tables?

There are also limitations in the operational models. Statistical offices all over the world are not always very well-funded. And governments sometimes give the priority to other statistics. But a main obstacle is often the cooperation between various institutions needed to create the accounts. You cannot do it alone in the statistical office. You need to work together with the entire government. You need to gather

data with the environmental agencies and energy agencies. This needs a government-wide approach of institutions willing to work together to share knowledge and data. And this is not easy. And that is why I was so happy to read your document, Eli, that in the United States, this cooperation is well-organized now, because you really need that.

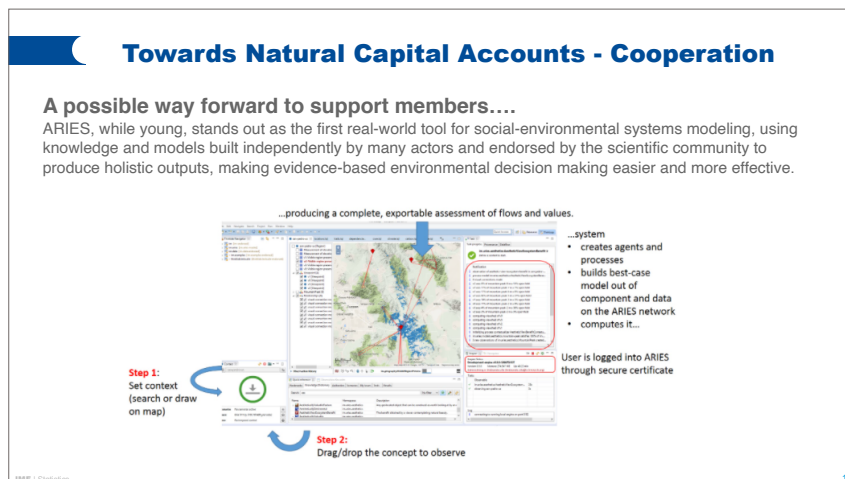
Chart 12:



Here is how it worked in the Netherlands. We were lucky that there are two departments interested in this, the Ministry of Health, Welfare, and Sport, and the Ministry of Agriculture, Nature, and Food Quality. They needed this data for policy making. An example is what to do with peat lands. Is it a good idea to drain them or not. If we drain them, there is fertile land fit for agriculture. If we do not drain them, we prevent the carbon emissions that result from draining.

We had a lot of cooperation with our environmental and our energy agencies in creating these accounts, especially with Wageningen University. They did a lot of the modeling, the satellite images, et cetera. A lot of data based on SEEA can be found on the Statistics Netherlands webpage. For example, a complete set of ecosystem accounts, including the difficult monetary valuation.

Chart 13:



Cooperation on data and algorithms is another exciting way forward. There is a new development called ARIES hosted by the Basque Center for Climate Change. ARIES stands for Artificial Intelligence for Ecosystem Services. This is a website containing open-source satellite data. It is interoperable data, which means they can be approached in the same way. And ARIES also contains a lot of artificial intelligence models that can be applied to the satellite data in order to automatically generate ecosystem accounts, basically for any region in the world, including local areas.

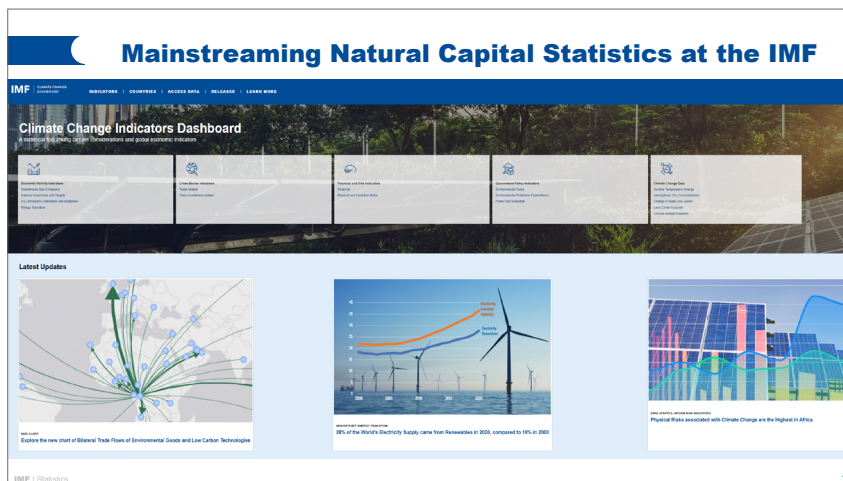
You can also bring your own data in the system. In the US, you probably have better satellite data than on the ARIES platform. You can also bring your own artificial intelligence model and combine that custom model and the data that is there to produce your ecosystem tables. It is tested in a number of countries in the world, and I hope this brings forward the adoption of SEEA-EA.

Chart 14:



So now to the IMF, because that is where I work now. Climate is very important for the IMF because we see that it has a large impact on economic and financial stability. The role of the statistics department is to provide data supporting the work of the IMF and the member countries. One way the statistics department is doing that is by introducing a climate indicators dashboard.

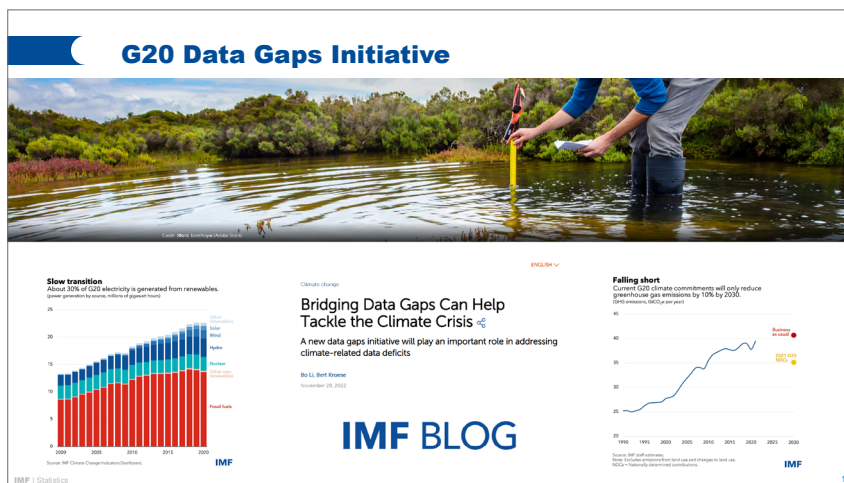
Chart 15:



This dashboard can be found on the [IMF website](#). There are basically five parts: One part is about the relationship between climate and economic activities. The second part is about cross border indicators like trade, foreign direct investments. The third part is about physical and transition risks and about green finance. The fourth part is about government actions related to Climate Change. And the fifth part contains more general climate data.

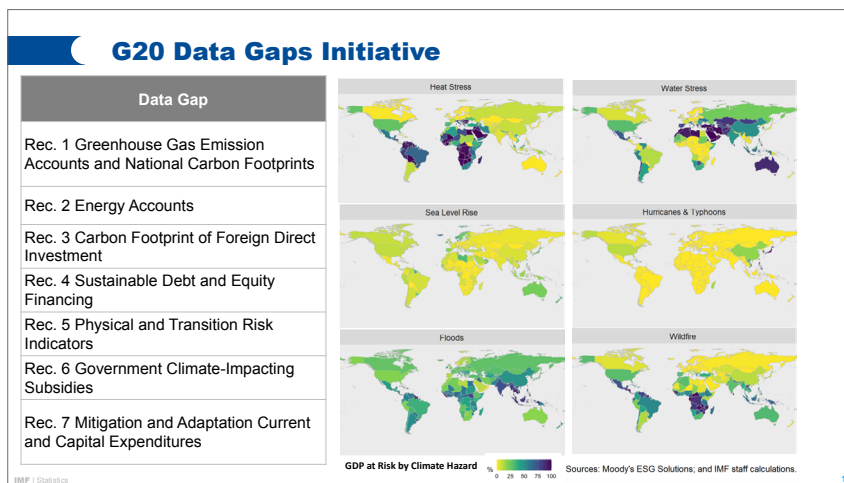
The idea of the Climate Indicators Dashboard is to bring together internationally comparable data. This dashboard is hosted by the IMF but we do not do it in isolation. We work together with the World Bank a lot. But also with OECD, the United Nations, FAO, and with many other institutions. Bringing the data together is really a global initiative. Not all the countries and all relevant indicators are in there yet. This is work in progress.

Chart 16:



The last thing I want to mention is something very exciting, the G20 Data Gaps Initiative. Last November, the world leaders of the G20 in Bali asked the IMF to work together with other institutions like the Finance Stability Board, UN, World Bank and the G20 economies to fill data gaps. And they decided on 14 data gaps. Seven of them were on climate, and the other seven were on FinTech, access to finance, income and wealth inequality. A lot of work will be done in the coming years to fill the data gaps based on these recommendations and that will also greatly benefit the data availability on climate. I wrote a blog on the DGI initiative with Deputy Manager Director Bo Li from the IMF.

Chart 17:

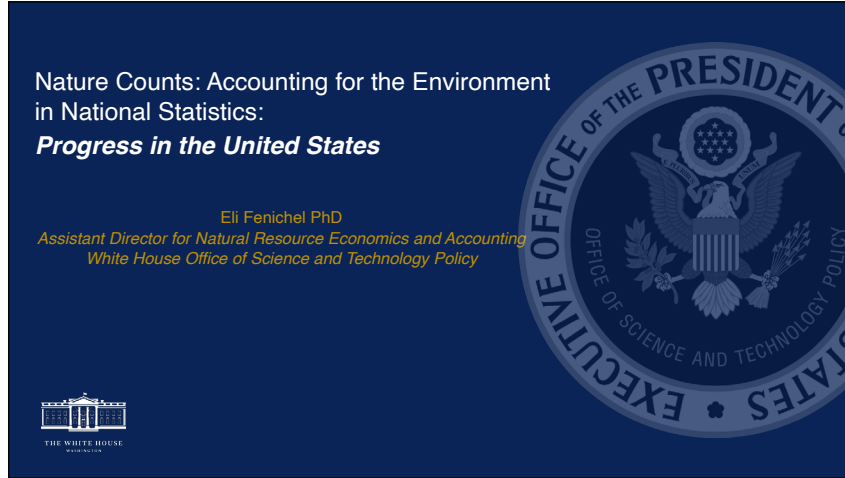


The seven DGI recommendations related to climate are to develop and publish data on: 1) greenhouse gas emission accounts and national carbon footprints in order to help deciding mitigation policies; 2) Energy accounts: the use and supply of energy, including renewable energies; 3) carbon footprint, foreign direct investment, and looking at carbon leakage; 4) sustainable debt and equity and financing - trying to come up with definitions and data that are internationally comparable. 5) Physical and transition risk indicators - what risks are affecting the economy; 6) government climate impacting subsidies, and 7) current and capital expenditure on climate mitigation and adaptation. This latter recommendation is important because if we have an unambiguous definition of government spending on these things, we can also use that to benchmark countries on their investments in mitigation.

This is basically what I wanted to say in my presentation. The positive message is that there are statistical standards to describe the relationship of the environment and the economy. These standards use the concepts of the System of National Accounts so data on the environment can be compared to economic data we are used to. These standards are already used in a lot of countries, but we hope for further uptake in the coming years. The IMF has the topic of climate change high on the agenda, and we will try to improve our database to support that purpose. Thank you.

Eli Fenichel: So, it is great being here. I am Eli Fenichel, the Assistant Director for Natural Resource Economics and Accounting at the White House Office of Science and Technology Policy. [Chart 1] If you are not familiar with OSTP, we work for the President's Science Advisor and we basically are the in-house science policy think tank. And this administration has realized that social science is a big part of science. So, I am excited to be here telling you about the progress that we are making on including the environment in national accounts.

Chart 1:



Last April, Secretary Raimondo, our Secretary of Commerce, announced that the US will initiate natural capital accounts and regular standardized environmental economic statistics. [Chart 2] She went on to say that we will be developing a national strategy and that by the end of this year we will begin implementing that national strategy and you can see her remarks on YouTube.

Chart 2:



And yes, last August, we put out a National Strategy for Natural Capital Accounts, environmental economic statistics, and took public comment on that for 60 days¹. You can view that. To date, we are up to 27 different departments, offices, agencies involved enthusiastically. This is an all-of-government approach working very well. And I will push back a little bit on what Linda was saying because there was actually quite a bit of expertise spread out through the US government in this area and not just USGS. And people have been enthusiastic to jump in and work together.

The strategy makes five principal recommendations. And I will go through what those five principal recommendations are. The strategy itself is almost a hundred pages long and there is a lot of detail under each of these, which we will not have time to get into, but I would be happy to discuss with people afterwards.

Chart 3:

Five Principle Recommendations (1)

Recommendation 1: The natural capital accounts and environmental-economic statistics should be **pragmatic and provide information to:**

- Guide sustainable development and macroeconomic decision making;
- Support Federal decision making in programmatic, policy, and regulatory settings;
- Provide structure and data that promote the competitiveness of U.S. businesses;
- Support resilient state, territorial, Indigenous, Tribal, and local communities; and
- Facilitate conservation and environmental policy.


The slide features a decorative graphic of seven hexagons arranged in a zig-zag pattern, each containing a different nature-related image: a forest, a green field, a sailboat, a blue sky, a blue ocean, a mountain landscape, and a yellow field.

The first recommendation is to be pragmatic. It is easy in this space to get lost in theory and try to get to the perfect. But our national accounts, over their long history, have been a pragmatic tool. And, there have been conceptual debates from the very beginning and the national accounts have continued to evolve. So, the goal here is to be pragmatic and provide information, and we focus on the five focus areas: one being sustainable development in macroeconomic decision-making -- much along the lines of what Bert was just talking about. And also, in supporting federal decision-making in programs, policies, and regulations.

And one of the things about a statistical system is it is not just the data, but it is the structure and the patterns in the data that help guide those decisions, which is why this is so important. We also recognize the need for the federal national accounts to help guide the private sector, taxonomies and organization information and benchmarking data. We also recognize that a lot of our national accounts data gets used to parametrize, and feed into, local planning models at various levels. It would be wonderful if the economy and the environment moved along together on a single track, rather than we analyze the economy and then we analyze the environment in some ad hoc way. And then try and push them together, but [we were to produce] an integrated set of statistics, and finally, of course, help with conservation and environmental policy.


¹ The National Strategy was finalized weeks after the panel discussion and the final strategy is now available at <https://www.whitehouse.gov/wp-content/uploads/2023/01/Natural-Capital-Accounting-Strategy-final.pdf>

Chart 4:

 Five Principle Recommendations (2)

Recommendation 2 Provide **domestic comparability through time** and **advance international comparisons** and harmonization.


- Means regularly repeated and updated
- U.S. needs to be engaged internationally



4


The second recommendation was to make sure that these are, first and foremost, domestically comparable through time, and then also to advance international comparisons and harmonizations. So domestic comparability through time goes right to what Bert was just saying about the need to be able to repeat the same statistics over and over again on a regular basis. The national strategy for the US proposes to get to at least an annual updating, and then it is also important to be engaged internationally -- and hopefully, we are planning more engagement internationally.

Chart 5:

 Five Principle Recommendations (3)

Recommendation 3 **Embedded in the broader U.S. economic statistical system**, and guide the process of embedding with three sub-recommendations.

- Incorporate the **internationally-agreed standards** ... guided by SEEA ... **following the standard supply-use framework**;
- To go beyond GDP ... more than one, but a small number of, **specific accounting boundaries**
- ... **best available economic science for monetizing** the value of natural assets.

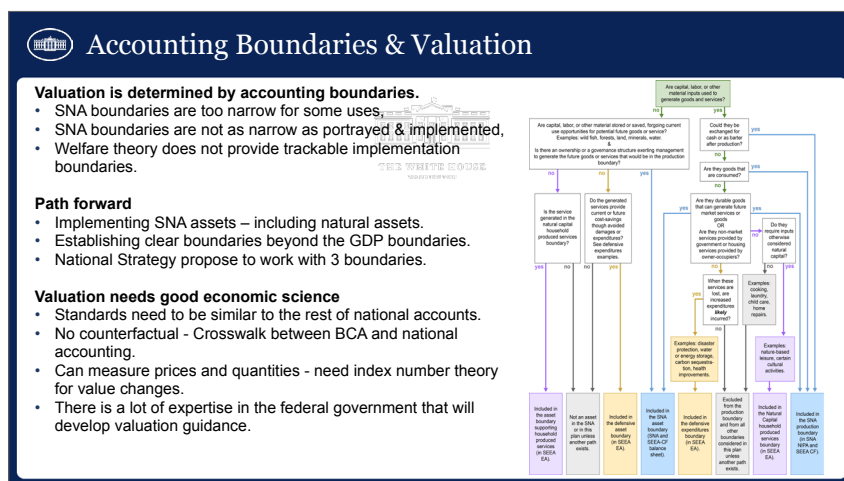


5

The third recommendation is to ensure that these are embedded in the US economic statistical system. And this is important because there has been some debate about whether or not environmental statistics should just be a separate set of statistics. But, we think that they should be aligned with the economic statistical system and aligned with supply-use tables that underpin the national income and product accounts as well as the national balance sheet -- and that they do need to work together. So, what this means is using the internationally agreed standards that we have been hearing about today, guided by things like the SEEA program, and developing supply-use tables.

It also means going beyond GDP. We spent a lot of time thinking carefully about how do we do that in a practical way? And we concluded that we need to think about the GDP boundary and the SNA boundary. And, then we need to have a small number of other tractable boundaries that we can also work towards -- and then using the best available economic science for monetizing the value of natural assets. I am going to say a little bit more about B and C because I think these are some of this is related to the ideas we have been hearing about this morning already.

Chart 6:



Valuation from an accounting standpoint is guided by the accounting boundaries. That is kind of what has to be valued. The SNA boundaries are clearly too narrow for some questions, and some policy questions, but certainly, GDP has proven useful for other policy questions as it is -- or as it has evolved, is probably a fairer way to say that. Also, the SNA boundaries are not quite as narrow as they are often portrayed and often implemented. So, there are some real gaps between what is in even the 2008 SNA that Bert was talking about -- being revised right now -- and what actually gets implemented in most countries. And that is true in the US as well.

On the other hand, we often think about economic welfare theory, which is my academic background. I spent a lot of time thinking about that. But as you dig into it, welfare theory does not provide a trackable accounting boundary for implementation. When I have to go talk to the people at our agencies about building a supply- use table, we need to find a path forward.


First, we need to actually implement the SNA boundaries around things like biological assets. And [we need to] figure out how to get the attribution correct because there are a number of natural assets, environmental services in the SNA, but they are probably misattributed to other things. Then, we want to establish other clear boundaries to go beyond GDP. We have proposed two additional boundaries for a total of three boundaries, and we have modified this OECD flow chart to try and map out how these different boundaries work together. The two additional boundaries we focused on are actually well-known that people have discussed since the beginning of the national income and product accounts.

One of these is an additional boundary that addresses defensive expenditures and the assets associated with them. We have actually noticed as you go through the history [that] there have been things that would have been in defensive expenditures -- and over revisions of the SNA -- have actually just made it into the GDP boundary. So, we think this is actually important to be forward-looking, period, and get ahead of the curve. Then, the other one is household-produced services, and particularly those related to the environment. We are thinking specifically here about certain leisure and cultural experiences. This does not bring everything that everyone would want into the system, but we have some boundaries to start moving the fence posts a little bit further, while maintaining the operability of GDP.

What does this mean for valuation guidance then? We want to make sure we set high standards, but we want to align them with everything else going on in the national accounts. And so, we do not want to set a standard for the environmental-economic statistics here [raises hand high] if the standard for everything else is here [puts hand down low]. Where does that leave us with valuation? A lot of our valuation experience for the environment involves non-market valuation, as has been mentioned. A lot of that has been developed in the context of benefit-cost analysis where there are clear counterfactuals. National accounts do not have clear counterfactuals. That does not mean the methodologies are unsound or not transferrable, but we need to do a careful crosswalk, and we have begun thinking about how to do that.

We know we can measure prices. We know we can impute prices for other things in national accounts. We know how to impute prices. We know how to measure quantities. One of the things we highlight in the strategy, that we seem to be lacking, is the appropriate index-number theory to think about that change in values. But there is a lot of expertise in the federal government, and federal experts are already starting to think about how we resolve these as part of our strategy.


Chart 7:



Five Principle Recommendations (4)


Recommendation 4 use a **15-year phased approach** to transition from research grade environmental-economic statistics and natural capital accounts to **core statistical products**:

- **Produce a new forward-looking headline measure** focused on the change in wealth held in nature: **Change in Natural Asset Wealth**.
- Supporting products, tables and reports that, Information in **physical and monetary units - dashboards**.
- First **pilot accounts appearing in 2023**, ... long term meeting high statistical standards and producing a durable & comprehensive set of statistics to expand the national economic accounts.



We also realized that we needed a long-term strategy. The national accounts have evolved over many years along with the national income and product accounts and the statistical system. So, we set out to lay out a 15-year phased approach right from the start, recognizing that we have a fair bit of research scattered around the US government in places like USGS, but also the BEA (U.S. Bureau of Economic Analysis) and also NOAA and also NASA and also Bureau of Labor Statistics. How do we advance those from being one-off research projects to being core national statistics that do not carry any research disclaimers? So that when federal government employees talk about them, they do not put this little disclaimer that says, "this is just my personal opinion," but is it actually the core statistics of the US?

Chart 8:

 **Aggregation and Summary Statistics**

Data matter

Statistical information is very useful in the supply-use table form

Physical and monetary accounts are important because they work like a Rosetta stone and help people talk to each other.

Dashboards are useful for communicating these data.


Aggregation or a summary statistic matters

Aggregation requires a common unit – monetary units are best candidate for an aggregate statistic.

- Change in wealth is well supported in the literature and what the US intends to use.
- Means filling out the non-financial, non-produced balance sheet.

That is where we want to get to over the next 15 years. That is also going to involve developing a new forward-looking headline measure that aggregates these. We are thinking about a change in the natural asset wealth, read off the non-financial, non-produced section of the balance sheet. That alone is not enough because it is also important to provide the underlying data, since a lot is lost in aggregation, in both physical and monetary terms. And we believe that dashboards will be quite useful. Who knows if dashboards will still be the technology that is the most useful in 10 years? But right now, that is what we are thinking. Maybe it will be like holograms or something; I do not know. And then also, while we have this 15-year phased strategy, we are not waiting. We are expecting to see our very first pilot accounts emerging by the end of this year.


Chart 9:

 **Five Principle Recommendations (Part 5)**

Recommendation 5 apply **existing authorities** and make use of the **substantial expertise within Federal departments and agencies**, by **coordinating** across agencies.

Authorities include:

- Paperwork reduction act (1995)
- Evidence act (2019)
- GAO report (2007)



The fifth recommendation is to use the existing authorities and the substantial expertise within the US government. As a whole, the US government was actually far ahead in the early 1990s, and then that all got scattered. So that is the best way to think about this. We did not lose it. It just kind of got scattered and went off in different directions, and now we are bringing it back together.

A lot has changed since the early 1990s in the US. We have completely overhauled our statistical system since BEA's initial foray into environmental- economic statistics. We had the Paperwork Reduction Act and the Evidence Act, which overhauled the way our statistical system works. It created the modern version of the office of the Chief Statistician of the United States.

Karin Orvis is the current chief statistician, [who] has all the authorities to do environmental-economic statistics. And actually, the Evidence Act is probably the first time that Congress actually called for national statistics related to the environment.

Chart 10:

Happening Now

Working hard to finalize the National Strategy

- 71 thoughtful and overwhelmingly supportive public comments

Activities already underway

- Chief Statistician's office coordinating natural capital accounts and environmental-economic statistics (classifications and valuation)
- Federal experts are actively working on:
 - Land account
 - Air emissions account
 - Environmental-activities account
 - Marine account
 - Water account
 - Pollinator account
 - Forest account
 - Urban green space account

<https://www.whitehouse.gov/ostp/news-updates/2022/12/15/joint-statement-of-the-government-of-the-united-states-of-america-and-the-government-of-australia-on-cooperation-on-natural-capital-accounting-environmental-economic-accounting-and-related-statistics/>

Joint Statement of the Government of the United States of America and the Government of Australia on Cooperation on Natural Capital Accounting, Environmental- Economic Accounting, and Related Statistics

DECEMBER 15, 2022

Nature Positive by 2030

PHOTO RELEASE

So, what is going on right now? [Chart 10] We are working incredibly hard to finalize the national strategy. I think we are getting close. We received 71 very thoughtful public comments. One of the interesting things about these, I will say, is that they look more like journal peer review comments, than the types of public comments we often get in government. These 71 comments, I think, were on the average of three to four pages long.

There are a lot of ongoing activities already. The Chief Statistician's office has already brought somebody in to start shepherding the technical work on natural capital accounts and environmental-economic statistics. We have folks in our various agencies across government already collaborating on a wide range of topical areas in the first and second phases. And then just last month we signed a joint statement with the government of Australia for further collaboration around environmental-economic statistics and natural capital accounting. So, I am excited to further converse with this group, and really grateful to Linda for pulling this all together.

Linda Blimes: Thank you. So, we have heard now about the challenges in the statistics, and the work that is going on today and the progress that is being made. How does this translate to the ground? What difference does it make? And so, I am delighted to introduce the former Mayor of Quito, Ecuador, Mauricio Rodas, to help us understand how this kind of data can help governments, especially cities around the world that are trying to use this data. And also to hear about what cities need from economists. Thank you, Mauricio.

Mauricio Rodas: Thank you so much Linda for this invitation. It is great to be part of this exciting conversation. So yes, we have heard about the importance of natural capital accounting at the national level but let us also think about it as a tool for sub- national governments. How can NCA be implemented at the local level, and what would be the benefits of doing so?

Chart 1:



So first of all, why should we be thinking about cities? What is the role of cities in the battle against climate change? Well, we live in a highly urbanized world. By the 1800s, only 3% of the world’s population lived in cities. Now, more than half of the world’s population lives in urban areas. It is projected that by the year 2050 it will be nearly 70% of the world’s population living in cities. It is in cities where more than 80% of global GDP is being produced. But if we talk about climate change, we must consider that it is in cities where more than 70% of CO2 emissions are taking place.

Chart 2:

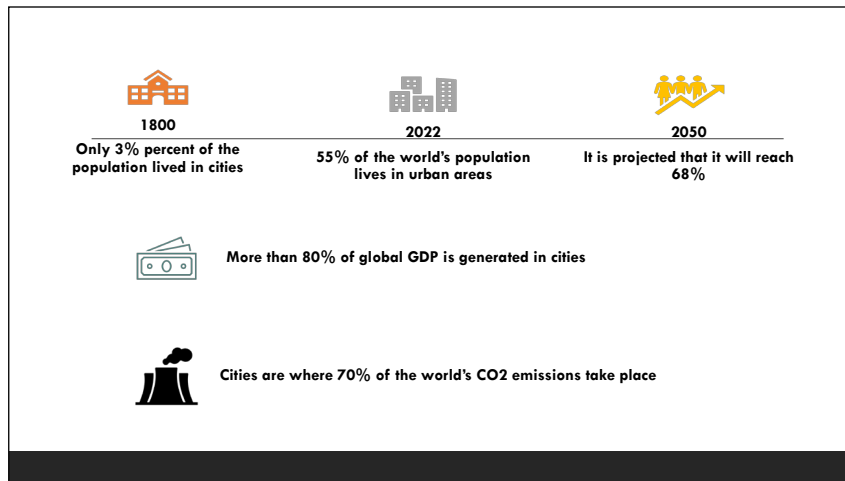
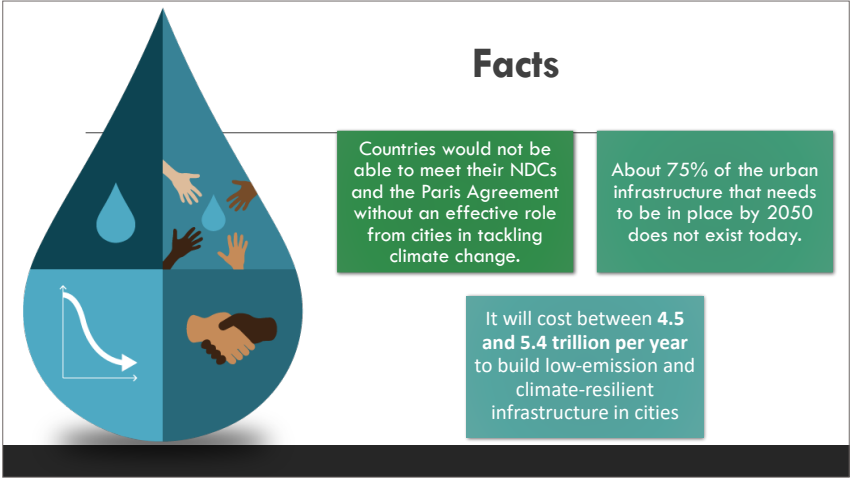
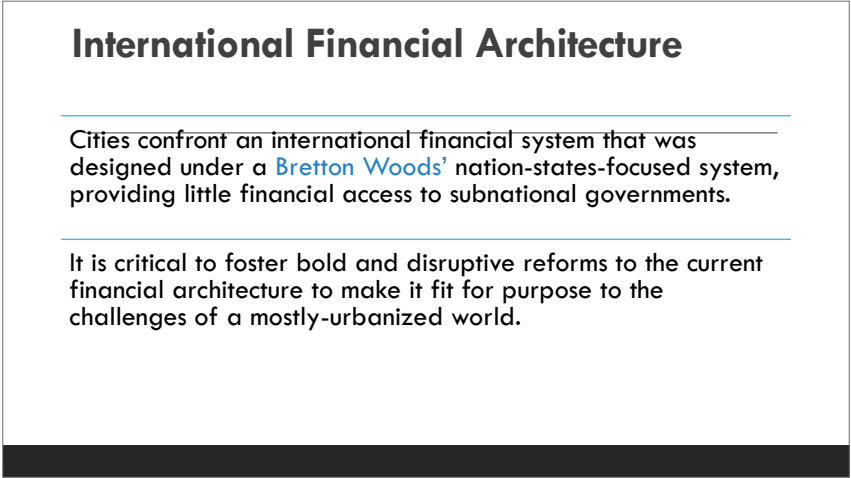


Chart 3:



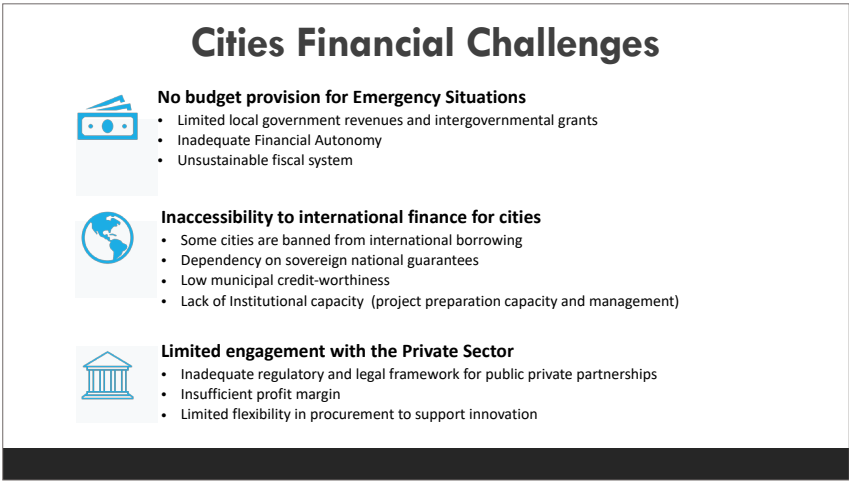
Therefore, it will be impossible for countries to meet their NDCs and meet the Paris Agreement goals without an effective role from cities in tackling climate change. And for cities to do that, they need to undertake a huge transformation in their infrastructure to make it climate resilient. The good news is that about 75% of the urban infrastructure that will be needed by the year 2050 does not exist today. So, we have time to make some significant changes in the way we develop that infrastructure to make it climate friendly. It is estimated that it will cost between \$4.5 and \$5.4 trillion dollars per year to build low emission and climate resilient infrastructure in cities. That is the amount of money that cities need.

Chart 4:



Unfortunately, cities confront an international financial system that was designed for countries, not for cities. It was designed under Bretton Woods in the forties when the world was not nearly as urbanized as it is today. We live now in a different reality, and unfortunately, the international financial system has not changed. It is still following the Bretton Woods logic of the forties, without reflecting the highly urbanized reality we are experiencing. And that is why it is so important to analyze and discuss bold and disruptive reforms to the international financial system to make it more cities-friendly. Otherwise, it will be impossible for cities to tackle climate change in an effective way. Therefore, it will be impossible for countries to meet the Paris Agreement goals.

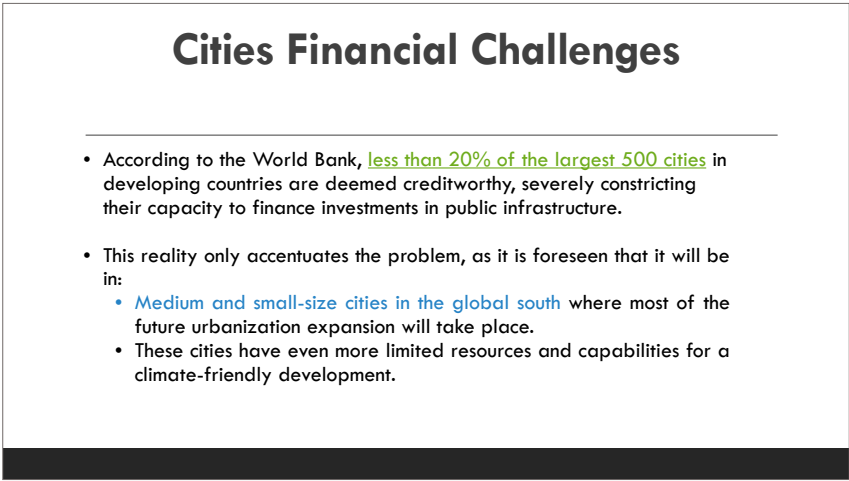
Chart 5:



What are the kinds of challenges that cities face regarding this current international financial system? There are no budget provisions for emergency situations in cities. When an emergency hits, cities have a very hard time confronting that reality. As we all know, they lack financial autonomy. They are constrained to intergovernmental transfers, and they have, unfortunately, unstable financial systems. More importantly, cities do not have proper access to the international financial system. In many countries of the world, cities are even banned from international borrowing. In some other countries like Ecuador, cities can access international finance. But they need a national government’s guarantee, which you cities may not be able to get because of political rivalries between the national and the local government. This is something that I personally witnessed, experienced and suffered from. So it is a big problem.

On top of that, cities in many countries of the world lack the proper level of creditworthiness or the institutional capacity to develop bankable projects. And when it comes to the private sector, in many countries of the world, cities experience a regulatory framework that is extremely difficult to implement -- for example, to undertake public-private partnerships, which is preventing cities from receiving private sector investments.

Chart 6:



Going back to the point of creditworthiness, according to the World Bank, less than 20% of the 500 largest cities in the developing world are deemed creditworthy. We are talking about the 500 largest cities. Can you imagine the situation of the medium and small-sized cities in the developing world?

It is much worse. And the problem is that it is estimated that those are the cities that will grow the most in the developing world. That is where the largest portion of urbanization will take place during the next few decades. Those cities are not prepared for undertaking the kind of challenges they have under the current financial architecture.

Chart 7:

Natural Capital Accounting in Cities




Natural capital accounting is a tool that can help subnational governments make better informed investments by providing a **consistent and widely used framework** for including natural assets in their decision making.

Now, why can natural capital accounting be an effective tool for cities to improve the conditions they have to face to access international finance? Because natural capital accounting can become a tool that will help some national governments make more informed investments, providing a consistent and widely used framework to include natural assets in their decision-making processes. Unfortunately, not many cities are doing so. Very few cities in the world have implemented natural capital accounting systems effectively.

Chart 8:

Case Studies London



Vivid Economics estimated that for every £1 spent on maintaining the parks, £27 of benefits are generated.

- London has more than 47% green space (parks, gardens, and woodlands) and 2.5% blue space (ponds, canals, rivers and lakes). Most of these spaces are owned or managed by the London boroughs, and other public agencies (such as The Royal Parks and Lea Valley Regional Park Authority) or environmental organizations.
- With constraints on public funding, these organizations are struggling to invest in and maintain these public spaces.
- London's public parks have a gross asset value in excess of £91 billion.

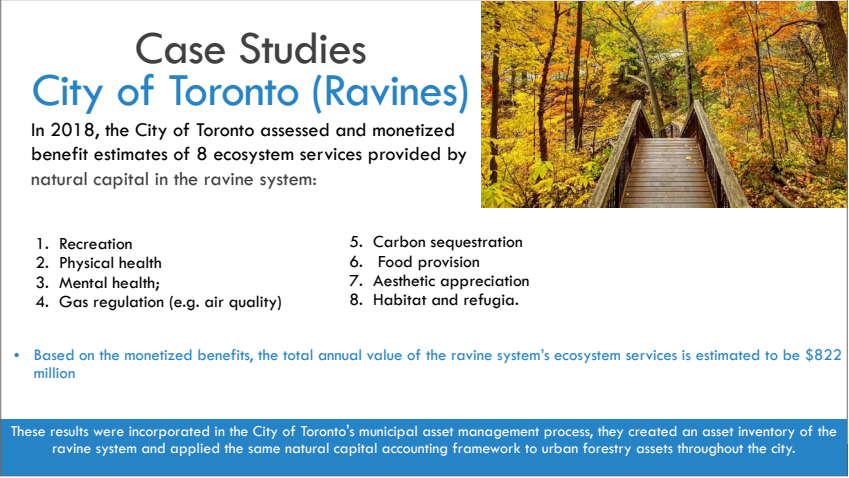
VARIABLE	PUBLIC SERVICES (£bn)	RESIDENTS (£bn)	BUSINESSES (£bn)	TOTAL (£bn)	SHARE %
Recreation		17		17	19
Mental health	1.4	3.4	2	6.8	7
Physical health	2.1	5.5	3.1	10.7	12
Residential property		55.9		55.9	61
Carbon (soil)				0.2	0
Carbon (trees)				0.1	0
Temperature		0.6		0.6	1
Gross asset value	3.5	82.4	5.1	91.3	100
	4%	90%	6%	100%	

The Natural Capital Account for London's Public Green Spaces is a significant contribution to the work necessary to ensure that NCA is applicable in an urban context and can be applied effectively to urban green infrastructure.

Note: The values are shown as present values evaluated over a period of 30 years, discounting at a rate of 3.5% per year. Source: Vivid Economics

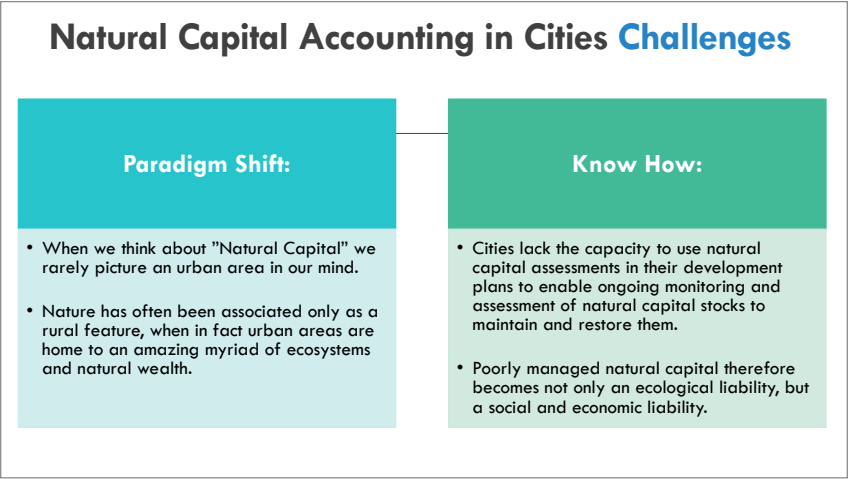
One of them is London. Some of the public agencies in charge of taking care of green and blue spaces in the city of London developed a study. They hired Vivid Economics, which estimated that for every pound spent on maintaining parks, £27 are considered as benefits of these kind of investments. They came up with a figure of £91 billion in assets for their green spaces. And of course, they valued the ecosystem services that these green spaces are generating.

Chart 9:



Something similar happened in Toronto. In Toronto, they assessed the ravines systems and the estimated value of the ecosystem benefits was estimated to be \$822 million. But again, much more has to be done. There are just a few other examples worth highlighting, and it is fundamental to foster the implementation of natural capital accounting systems in cities. But in order to do so we face several challenges.

Chart 10:

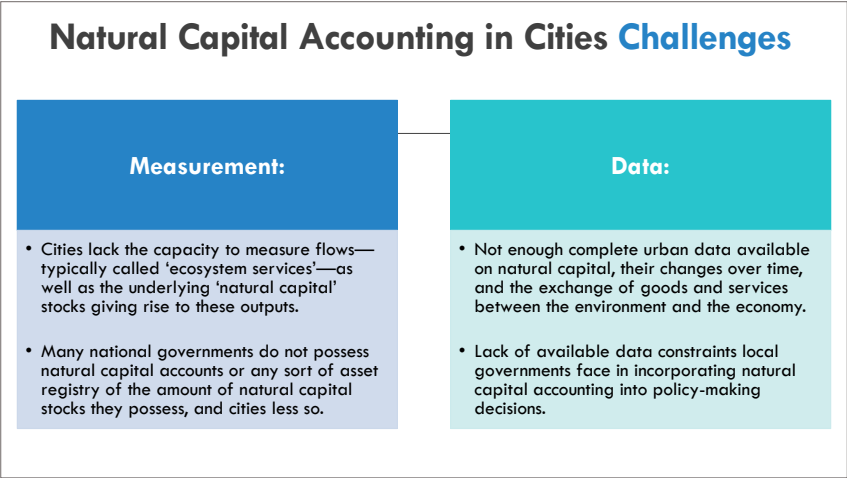


Bert mentioned some of the challenges that national governments are confronting. Many of them also apply to the sub-national level, but on top of that, cities have additional difficulties.

First of all, we need to promote a paradigm shift because when we think about natural capital, we rarely have an urban picture in our mind. Most times, we think about rural areas as those that are related to natural capital. When in fact, cities, urban spaces are home to a vast diversity of flora and fauna. And that is why it is so important to take care of urban biodiversity, but most importantly, to put value, and monetize urban biodiversity.

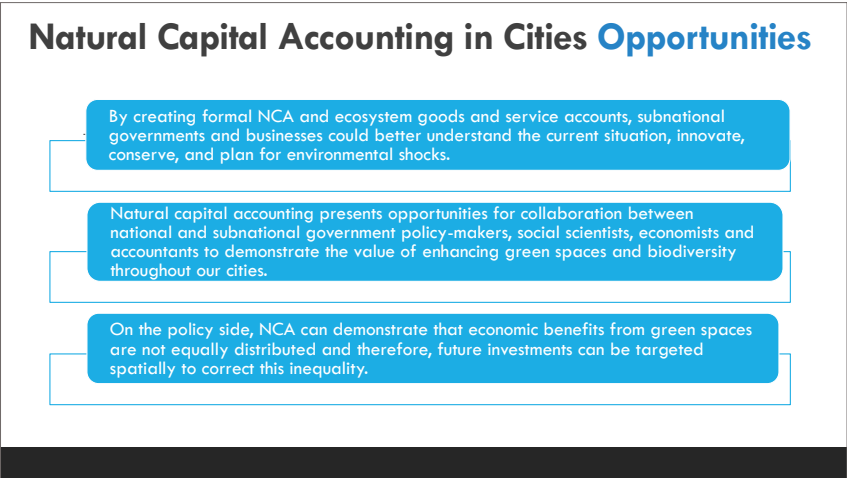
There is also a problem regarding capacity. Cities lack the capacity to use natural capital assessments in their urban development plans. We need to develop that institutional capacity. There is, of course, just like it happens at the national level, a problem regarding measurement.

Chart 11:



Cities lack the capacity to measure the economic value of ecosystem services, which is fundamental to foster a proper natural capital accounting system. And also, there is a lack of data, and not only for natural accounting, but for many other aspects of urban life. In addition the lack of data is preventing local governments from proper urban development planning.

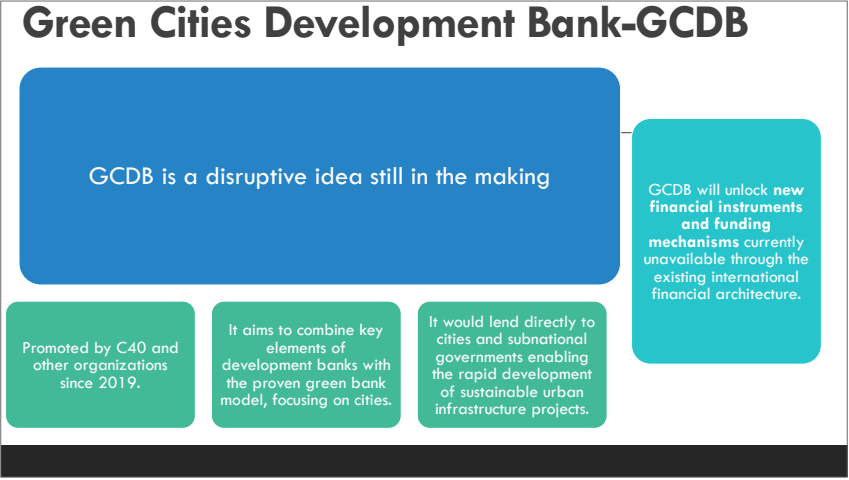
Chart 12:



Now, what are the opportunities? There are many. By creating natural capital accounting systems in cities, national governments will be in a better shape to understand the current situation, innovate policies, and conserve urban biodiversity in a much better way. Natural capital accounting also represents opportunities for a better collaboration between different levels of government, the private sector, and civil society, to conserve and restore urban biodiversity throughout our cities. And if we talk about policy, NCA can show the benefits of green spaces in a city to better allocate resources for a more equal distribution of green spaces in the future. We want to have more equally developed cities. If we want to address inequalities in different areas of the cities, the allocation of resources to develop green spaces is fundamental.

Now, this is an idea that Linda and I have been talking about. Also, I had the opportunity to share it with Joe. If we think about the need to reform the current international financial architecture to make it more city-friendly, there are some ideas that have been discussed that are on the table to promote bold and disruptive reforms.

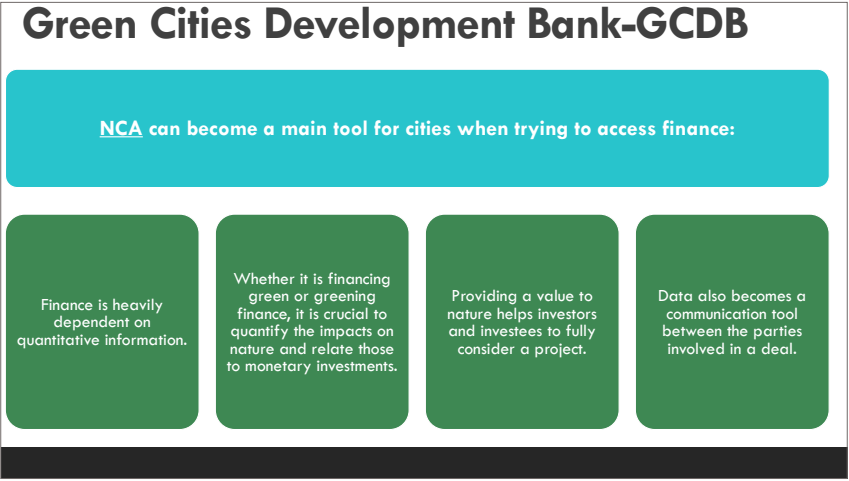
Chart 13



One of those ideas to further explore is the creation of a Green Cities Development Bank. So, this would be an institution that could combine the benefits of a green bank with the model of a multilateral development bank for cities.

This idea was promoted by C40 in 2019 and is currently being discussed. It is still an idea in the making, and it would be a mechanism to provide direct financial facilities for cities to undertake the kind of infrastructure transformation they need to tackle climate change effectively. The institution, for example, could become a guarantees fund. It can become a way of providing more concessional grants directly to cities, provide technical assistance, among other services, and a part of it can be precisely the development of natural capital accounting.

Chart 14:



This bank can become a mechanism to foster the implementation of this tool by providing technical assistance for cities. This can be done by developing a standardized way to measure natural capital, creating different mechanisms to make natural capital accounting an effective tool to attract more investments in cities, [and] particularly coming from the private sector, putting value on nature in cities.

So, these are the kind of ideas that are being discussed now. I think that combining them in a meaningful way can help cities and urban areas around the world, protect their natural capital, fight against climate change in a more meaningful way, and more importantly, provide a better quality of life for their citizens. Thank you.

Linda Blimes: Thank you. So, before we hear from Joe, I wanted to mention again that we are going to transcribe and edit these presentations and publish them on the Economists for Peace and Security platform, where they will be widely available.

Joseph Stiglitz: What I am going to do is try to put a lot of what has been talked about in perspective and focus comments on a few particular issues. I am so impressed with what has happened over the last 10, 12 years since we began working on this -- and I will talk about what I actually began working on 30 years ago. Then I will come back and give some other examples.

Chart 1:

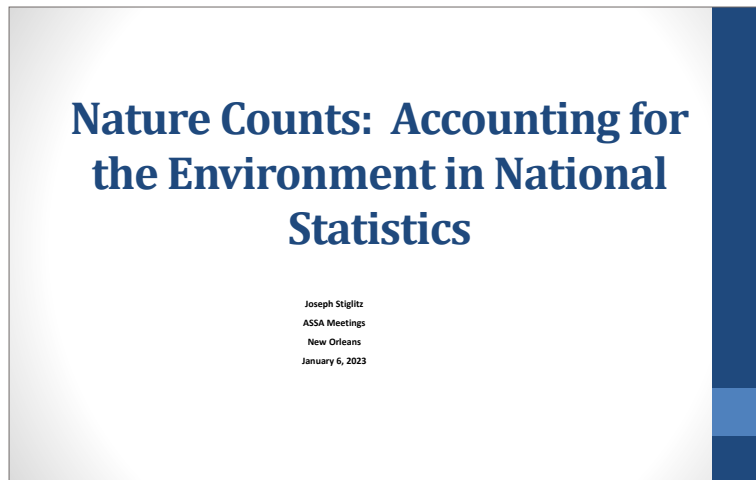


Chart 2:



The idea that you needed to go beyond GDP was actually recognized very early, even by Kuznets, who set up the national income accounts. He was very clear that it was not a measure of welfare. It was a measure of market income. I think he was worried that it would become a measure of welfare, and over time it has increasingly become that measure. As is often the case, the people who create these things understand the downsides more than the people who use them afterwards. There is a famous quote many of you may know from Robert Kennedy, in a famous speech he gave, that "GDP measures everything except that which is worthwhile." He then went on and elaborated on that and I think he captured a lot of our discontent with GDP.

Our original commission talked about a number of things that were included that should not be—defensive expenditures, for instance. GDP goes up when we spend more to protect ourselves against violence, and GDP goes up when we have to repair from climate change. So, if we do not do anything about climate change, GDP may go up but it will be just the opposite of what we want. So that, to me, is a really good example of why GDP is not reflective of what we really care about.

There is also inequality, insecurity, whole other aspects of subjective wellbeing and sustainability. And I am going to talk mostly about sustainability in all of its dimensions. I am going to talk about natural, environmental sustainability, but there are also social and political sustainability. The importance of this has already been mentioned because what we measure affects what we do, and what we do not measure will affect what we do not do. I am old enough to remember when inequality started really increasing in the mid-seventies -- and under Reagan it grew a lot. His solution was to stop measuring it because if you stop measuring it, it will disappear because nobody will notice it.

Of course, many of us thought that was not going to be the solution to the problem of inequality. The reason that President Sarkozy in France pushed to establish the International Commission on the Measurement of Economic Performance and Social Progress was that he felt under enormous pressure to produce [higher] GDP. Governments are rated on how high GDP is. But he also knew that French citizens in particular were very sensitive about the environment, and that if he did not do things that were good for it, he would be held accountable.

He wanted us to create a framework, you might say a report card, that was better than GDP, that was more reflective of what the citizens of France were concerned about. And then that morphed into the OECD Better Living Index and the initiatives of the OECD. One of the aspects of moving this into the OECD is that it is important to have international comparisons. It is important to have comparisons over time, but also international comparisons. That is why it is really important for the IMF to do it because the OECD is really specialized in the advanced countries. I began an initiative when I was in the Council of Economic Advisors under Clinton to create a system of environmental accounts, a green GDP, even satellite accounts.

For those who do not know, most of the GDP statistics are developed in the Department of Commerce. So, the Council of Economic Advisors, working with the Department of Commerce, was making some progress until a large group of congressmen said that if you continue to do this work we will totally defund this whole area of government. We knew we were onto something important because if it were unimportant, they would not have put the political capital into threatening us with defunding. But it did put a cold shower on our progress at that time. And in the work that we did in the successor in our Commission on the Measurement of Economic Performance and Social Progress, and the successor at the OECD, there was active participation from the statistical offices of many of the European countries and Canada, but not the United States. We were an observer but not really engaged. That is why I am really pleased that now we are fully on board. That is a big change.

One of the reasons I think that this is so important is because it affects policy. We have been concerned about the extent to which these statistics are influencing policy. And there are a few countries that have picked up this agenda of beyond GDP. Most of them are not yet focusing on the environmental statistics but focusing on other aspects. Former New Zealand Prime Minister Jacinda Ardern has been particularly concerned about aspects of the "beyond GDP" agenda having to do with children and their wellbeing. It is a kind of capital that is not well measured typically, and she has made the measurement of that important. One of the interesting things about both New Zealand and Australia is

that a lot of the support for this initiative is coming from the Ministry of Finance. And that reflects their view that better statistics, in a broader sense, including those that better assess the environment of children, as well as every aspect of inequality, lead to better resource allocations. And the ministries of finance feel that to do that is part of their responsibility in allocating money. And they think that our statistical systems today do not give the kind of information that is important to them in making those allocations.

So, I think this is a really good time for this conversation. Next May, at the G7 meeting in Japan, these issues are getting discussed at the level at least of the finance ministers, and hopefully of the presidents. This had happened once before in the Pittsburgh meeting of the G20, but then it got lost – and so there were lots of other things that happened in the world. But I am hopeful now that this is being brought back onto the agenda.

Chart 3:

Sustainability

- Best measure of ability to sustain standards of living is captured by wealth
 - Physical capital
 - Human capital
 - Social capital
 - Natural Capital
- Critical problem is *valuation*, determining relevant prices
 - Especially hard in context of biodiversity
 - But even for climate change
 - Debate about the social cost of carbon
- But we know *zero* is not the right price
 - Implicit price we assign when we ignore natural capital

3

This session is about one aspect that is not captured well in our GDP statistics – this notion of sustainability. And there is a strong basis in economic theory explaining why the best measure of the ability to sustain standards of living is captured by our measures of wealth—more accurately, wealth per capita. If our wealth (per capita) is going down, we’re less able to sustain standards of living. And it is going down: We are not investing for the . That is why it is very important to have measures of wealth in all the dimensions. Traditionally we focused on physical capital. We talked about human capital; there was work on social capital, and this session is about natural capital. I think trying to create systems of natural capital accounting is a really important aspect of the assessment of sustainability.

There are two aspects of doing this. One is the physical measurements. What is going on? And here some of the methodological and technical advances are really incredible. You can actually measure physically CO2 concentrations or emissions, or what is happening to water. You can do it with satellite. So, what is going on the physical side is very impressive. But from the economic point of view, the hardest issue is valuation. How do you take these fiscal numbers and add them up? And it is not only that many of these things are not marketed. When they are marketed and there is a price, there are so many market failures that there is no correspondence between the market price, and, you might say, the social marginal value.

And that is really important to recognize – that the prices we want to use are unrelated to market prices. There may be a price of water, but it does not have anything to do with the value of water [or] the value of water in terms of Adam Smith, but in terms of the marginal value of clean water.

So that presents, I think, the biggest challenge and there are a number of methodologies that are used to value various parts of this.

I loved your discussion of the whale. You talked about each whale being worth \$2 million. And you mentioned that it is partly because of the impact it has on the whole carbon system, including plankton. But we have to then value carbon. As many of you may know, one of the first things that President Biden did was to call for a revisiting of the price, the social cost of carbon. President Trump had put a price of \$7 a ton. Obama had it at about \$30. And the number that President Biden's team came up with, I think the final is around \$60. That is half of what it should be. It is clearly much higher than that. I think the models they use to calculate are really, really defective.

Interestingly, one of the members of the Council of Economic Advisors -- not a member but a staff member colleague of mine at Columbia -- Noah Kaufman, has written a paper where he pointed out it should be \$120. And I think that is really in the right ballpark, partly because they left out a whole set of things like risk and how you value risk and how you value impacts on inequality. But that means that if the effect of carbon storage associated with plankton is an important part of the whales' valuation, your whales are much bigger than \$2 million.

Chart 4:

Need for a dashboard

- International Commission on the Measurement of Economic Performance and Social Progress recommended using a dashboard, so that we could at least keep tabs on what is happening quantitatively to key aspects of the environment
- Such metrics should be an important part of our system of national statistics
 - Carbon emissions
 - Key air pollutants
 - Wetlands
 - Other components of natural capital

4

But when we go into the areas of biodiversity, which are some of the things that we have been talking about, those values are even more difficult to estimate. So, that was one of the reasons that our commission recommended the need for a dashboard. When aggregating things you lose information, and the point of GDP is that you want a number that you can focus on. But one number is too few for describing an economy. A billion numbers are too many to grasp. And so, one way of thinking about it goes back to the pragmatic approach of what we are trying to do here. One wants to have a set of numbers small enough that you can focus on what is going on and discuss it, but not so small that you lose information that is important for assessing what is going on in the economy.

So, the way I sometimes describe this is if you were driving a car there are two numbers that you might want to know: The speed of the car and how far you can go. Say you can go 250 miles and you are going at 50 miles an hour. If you added 250 and 50 you get a number 300 that does not tell you anything. It does not tell you either how fast you are going or how far you can go. So, there are some cases where trying to add things up does not make sense.

Trying to think judiciously about what the elements of the dashboard are, when you can aggregate and when you do not want to aggregate, seems to me one of the critical things. You may not want to aggregate because the numbers are not commensurate, as in the example I just gave. But you may not want to aggregate because of the degree of uncertainty on some of the variables: The imprecision is so great that when you add up something that is precisely known with something un-precisely known, the total is un-precisely known. That clouds the information you have about the part that you do know. So that is why we recommend a dashboard.

Chart 5:

Estimating values

- In some cases, we can provide good estimates (or bounds) of valuations
 - Capturing effects on health and life expectancy
 - Methodologies for capturing individual valuations
 - Social cost of carbon, derived from target consistent approach— approaches consistent with achieving globally agreed objective of limiting climate change to 1.5 to 2 degrees C.
 - Appropriate approaches need to take risk into account—resulting in a higher value to the decrease in key components of natural capital
 - We've come to appreciate the importance of climate risk—key driver in climate policy
 - Similarly, there are large risks associated with the deterioration of other aspects of natural capital, the degradation of the environment

There are multiple uses for quantitative assessments of natural capital and how it is changing. In terms of estimating the values, in some cases, some of the things that are not marketed, we can make inferences. For instance, we do not have slavery anymore so we do not have market values of life, but we can make inferences about what people feel about the risk of losing their life, the statistical value of life. So that is one aspect of risk and there are other aspects of risk that we can make inferences about. We have to think about them cautiously from the choices people make. Linda and I, in our book, did a lot of that in terms of assessing some of the cost of the Iraq war. So that is one area where you can make some inferences.

Another methodology that has been used at times is contingent valuation: what people are willing to pay in order to preserve something. So, whales are something where even before it was recognized that whales were good for the carbon system a lot of people had very fuzzy feelings about whales and would have been willing to pay quite a bit to make sure that we had the biodiversity of whales. It was not for the oil they got from them or for the meat, but just having an ecosystem with whales.

So, while in the area of these non-marketed goods we cannot get the same precision that we have in the case of marketed goods, we can still make inferences.

That brings me to another point I want to make in the area of GDP. We make all kinds of assumptions and we ignore all kinds of imprecisions, and it just does not bother us. The macroeconomists run regressions as if these data meant something and they have some systematic characteristic to them. So, they do mean something, but they do not have the precision that we often pretend they have.

Chart 6:

Aggregation

- When we obtain reasonable estimates of what is happening to various components of natural capital, can use these numbers to assess whether economic growth is sustainable—and to assess whether today’s consumption comes at the expense of the wellbeing of future generations
 - Including risks that we are imposing upon them

6

We know that any good is sold at multiple prices in different stores and on different days. And the way you collect the data may affect the prices that you use. So that is just one example of how we treat depreciation, depletion and so forth. A lot of the stuff that goes into this SNA, System of National Accounts, are conventions like all accounting conventions that are agreed upon. It is pragmatic; we make agreements to go ahead and make comparisons, but there is no holy grail. And what we are trying to do in this arena is to make a similar set of conventions, to be able to continue to discuss them and say where are they wrong.

Chart 7:

Promoting national and global dialogues

- Need scientific assessments of the consequences of the changes in natural capital
- Economic evaluations of these consequences can sometimes be done through *inference*—values derived from valuations individuals place on health
- Because of large risk and absence of markets in many of relevant areas, we need policy dialogues to make other assessments, and can “back out” social valuations from these deliberations
 - Example: international decision on climate change
- But to repeat: Zero is not the right number; omission of natural capital from systems of national accounts is a major omission

7

Let me just conclude with the importance of promoting national and global dialogues. We need to think about this at multiple levels. We need the scientific assessments of what is going on, and the quantitative measures of what happens. The effect of photo plankton in storing carbon was not something that was appreciated 20 years ago or 10 years ago. So, we really need to recognize that our knowledge about the science of natural capital is going to be changing very dramatically. And that recognition means that things that we did not include before we will want to include. So, we will have to revisit our systems of natural capital more than we do physical capital. Because I think we are learning more. It is a very complex system.

We will also have to continue to revisit the economic valuations. I think we are beginning to understand better the consequences of market failures and to be able to correct for some of those market failures -- for the implication they have on the shadow prices of capital goods, including natural capital.

The integrated assessment models were good models for assessing what was going on 30 years ago. But they are not particularly good models now because most of them do not include adequate assessments of risk and inequality and have a number of other deficiencies. Because of the large risk and absence of markets in many of the relevant areas, we will need to have policy dialogues to make other assessments.

Sometimes we can back out valuations from those assessments. So, one way of thinking about what is the correct shadow price on carbon today is what the international community has said. Do we want to take the risk of allowing climate change of an increase in temperature more than 1.7 degrees? They said, no we do not. Well, what does that mean? That says their evaluation of that risk has put a shadow price on that.

We cannot criticize that. That is a valid assessment of that risk. And if economists ignore that, we are ignoring something of first-order importance to the community, i.e., the international committee is making a decision about that. So, economists have actually not been very helpful in this because they have not paid attention to things that are first-order reports to most people, as they think about climate change. But to repeat something that was said several times already, what we know is [that] zero is not the right number for the valuation of natural capital. And omission of the natural capital from systems of national accounts is a major omission.

Nature Counts: Accounting for the Environment in National Statistics Panelist Discussion

Linda Bilmes: Thank you. I'd like to take a few questions, but before I do, I just want to summarize what we heard about the importance of this issue. We heard about the enormous progress, particularly on the technological and scientific side. We also learned about a couple of challenges, and I'd like the panelists to address two particular challenges.

First that many of the key decision makers, who are going to be using and relying on and needing this data are in cities. Cities will be making decisions on topics such as whether to protect a forest that is filtering water, to a large extent. or to build a cement water treatment plant instead? So how do they make that decision? How do we translate environmental economic data into a format that is easily usable for cities and other decision makers, particularly on infrastructure projects? And shape the multilateral institutions and to make those projects creditworthy?

A second question relates to the valuation challenges that Joe Stiglitz just described. How do we incorporate natural capital into a situation where we have such an imperfect market? And let's touch on the issue with respect to the private sector and how to bring the private sector into this. We'll start with you Bert.

Bert Kroese: Okay, thanks for these great inputs. Before I answer the question, I want to come back to the situation of the US. The US has actually been very instrumental to bringing forward these standards. About 600 people have contributed in producing these ecosystem standards. Many US academics, people from BEA and all were very involved. So, there is a lot of knowledge here in US and I want to acknowledge that.

Coming back to cities. Well, I think the whole idea of ecosystems also applies to cities. I think one important requirement is that there should be very detailed satellite data. Luckily, I think there are satellite companies that want to work together with the statistical community on this; for example, I talked to the European Space Agency (ESA) last week before Christmas. I think there are many things that can be done.

On valuation, yes, we can talk for a long time about that. It is clear, there were many discussions when we produced this ecosystem accounting manual. Agreeing on the principles how to measure the extent and condition of ecosystems and the qualitative descriptions of the services was in the end relatively straightforward. But the discussions on valuation were more difficult. There are two chapters in the manual on this and basically all arguments and approaches are there. Obviously if there is a well-functioning market it's simple, we know what to do. But if it is not, what do you do? A number of approaches are described. For example, you can look for similar products that are on the market. You can also look for what the costs would be to produce something that would provide the same service. For example, for flood protection, what are the costs of creating a dam or dike to provide the same flood protection a mangrove forest gives? For recreational services, you can measure how much money people want to spend on gasoline to go there. At least that says something about how much they are valuing it. So, there is a lot there already, a lot of methods. Nothing is perfect though and there is still a lot of discussion.

But I agree with you, Joe. The value zero is wrong anyway. Also in the CPI and National Accounts this kind of valuation assumptions are made. We will keep doing research on valuation, and I hope we will make progress.

Eli Fenichel: Okay, so I think everything Bert has said about local is a hundred percent accurate, and I think the technologies are getting better to make that possible, very rapidly. The one thing I would add is I think that, or I should say I am optimistic that as cities can start doing natural capital accounting, at the very least they are showing managerial competence that I would hope in the not too distant future they'll be able to bring to capital markets. And I think some of the issues that Mauricio was talking about, about the limitations cities face in accessing capital that are structural, natural capital accounting isn't going to help, but it is going to push those issues further. So, I am optimistic on that front. It is something we have been thinking about.

On valuation, I agree with Bert, we can talk about this for hours. It is something I am very interested in from my academic life as well. I think what I will say is that personally having thought about this, looked at this a lot, the issue is not about measuring prices and quantities. I think actually if you sit down and do the math, it all works out to be approximately, certainly good enough within the other errors in international accounting. We do imputed prices on other things, like owner occupied housing, not particularly controversial. The real issue becomes how do you do, when we know we have prices and quantities both changing in welfare theory, we approach this one way through Hicksian measures in national accounting, we approach it through index number theory. There are some cases with superlative measures where we know these line up, but we have not fully worked these out for when you've got non-market effects in there. And I think this is just a technical issue, and we just need, I think, just more people, like in this room, helping dig in on it, because it is a small community that is thinking about it.

Mauricio Rodas: So, something that for me is fundamental is how can we foster political commitment on the part of mayors to do these kinds of things? If we think about what was happening 10, 15 years ago, back then, you saw very few mayors that were committed to the climate agenda. That has changed dramatically. Now, you see a lot of mayors doing great work on climate, working very enthusiastically on it, actually, and sometimes leading the way at the national level, being very bold and disruptive. And the reason for that, I think, is because they have realized that climate change is not only important for the sake of climate and the planet, but for the sake of improving people's quality of life. And I think that when mayors have incorporated that component into their agendas, that made a huge change.

Of course, a lot still has to be done. But I think this is a kind of mechanism that we should pursue with mayors by making the case of how developing a natural capital accounting system can help them to attract more investments into their cities. And to develop climate projects that will, at the end of the day, improve people's quality of life, and actually save people's lives. When they incorporate that dimension into their political speech, it turns out to be very sexy, actually. Because the problem is that when mayors in the past talked about climate, it was not sexy enough. So that is why not many of them did it. Once they have realized that talking about climate change and doing projects in that particular area can become sexy -- because at the end of the day, it is about improving people's quality of life and saving people's lives -- then the situation changes. And I think we can do something similar with natural capital accounting by making the case of how beneficial it would be for them as a mechanism to attract more investments, and to demonstrate the importance of valuing nature for improving people's quality of life. At the end of the day, it is a political game. Mayors are politicians, and they need to find the political profitability of doing this. And I think that this a very easy case to make, but we need to do it fast.

Joseph Stiglitz: So, the first point I make, one of the things that makes cities so interesting is that they are a complex, interacting system where externalities are really important. And it's exactly in areas where externalities are important that economics finds the greatest challenges, to put it euphemistically. That is to say, pricing is difficult, trying to assess the value of one thing versus another, the kind of questions that Linda pointed out. Some of this is understanding the science of these externalities.

I think every time we see something like what happened in Houston -- from having so much of Houston paved over -- and what that did to water; it reminds people that cement has consequences. It has advantages in durability, but it has some very big disadvantages. And green may be better not only in carbon, but in other ways. But the point I want to make is that because it's a very complex system, valuations are going to be very, very difficult. And I think the big advance is that people are beginning to now think about some of these systemic effects in a more systematic way. And I think that is a big advance.

The second thing I did want to comment on was that I think the green city bank, which you have been promoting, is a really good idea. While getting the private sector, green finance, is really important, one has to remember that the private sector is very bad in assessing long-term investments, and climate is long term -- nature is long term. The private sector is very bad at assessing risk, and there is a lot of risk in everything we are talking about in terms of climate. And the private sector does not do anything about public goods and externalities. So, I think we can expect a lot more of the private sector and we can try to get more out of it. But in the end, in some of these vital areas, it is really important to have more active public-sector, multilateral development institutions, and in particular, green city banks.

And one of the reasons why I like the idea of green city banks and green community banks -- and there are some being developed around the world -- is that they focus on the community. And because they are focusing on the community they do focus inevitably on some of the externalities of the interactions. And so, you can get the voices of those who are being affected more directly in a green city bank than you get at a very high level, at the multinational.

The final comment I want to make is how it is important to realize that we make a lot of imputations in our GDP accounting, and they have consequences. Our measured inflation would be markedly different if we treated housing differently than the way we do. We are all going to suffer because the Federal Reserve does not understand this very well. And so, it has hyperventilated about some aspects of inflation, and we are going to talk about that a little bit in a session we are having this afternoon.

The fact that there is this debate about the right social cost of carbon, is it seven, 60, or 120, makes a very big difference for our decisions. And so that kind of valuation, I think, is a first-order of importance. And climate change is probably the existential issue of the day. And if we cannot get that right, then we are not going to get a lot of our other policies right.

Linda Bilmes: Thank you. Let's take some questions So the gentleman over there.

Stefan: So, I am Stefan of Zurich and investment. So, I have a question on method and communication for method. When you've been talking about building an index for the valuation, I want to point out there is a problem sometimes of nonlinearity. For instance, if you, say, I want to build an index where I have the value of the water aquifer and the value of insects, pollinators, and the value of other things, well, the problem is that without pollinators, you have no economy at all. Without water aquifers, you also have no economy at all, because we'd just decline entirely. And so, there is no linearity there, which aggregating, as Joe was saying before, does not make sense, because without a single element of those, you have zero. And so, I was wondering, is there any work on that that has been done that will take into account which is critical of that?

And about communication, whenever there is an event, COVID, Ukraine, we read in the newspapers, "Oh, this country, the UK has lost 20% GDP." Now, when is it that we will read... Can we expect, at some point, to read in the newspapers, "Oh, this or that country have increased GDP, but have lost 10% of their natural capital," for instance? Because that would change a lot of the conversation. And so, do you have any reflection about why is it that it is not happening yet? We will see it one day. How ready are the data that you guys are preparing? But by the way, congratulations. It was really very interesting and insightful. Thank you very much.

Bert Kroese: On the latter part, that is exactly what should be done. That is goal, that we do not only publish the economic development, but also what happened to the environment, to natural capital, and to climate. We are not there yet. But for example, in Statistics Netherlands, we publish data for the greenhouse gases along the same rhythm and according to the same definitions as reported GDP amounts. At least you can see it in the same time and tell the story in the same way. For example, we have made more profits but on the other hand we had more carbon dioxide emissions.

Another thing is that in the Netherlands, we produce the Monitor of Wellbeing, which is basically built on the concept of natural, social, human, and economic capital. Every year in May, when the government has to go to parliament and has to discuss the consequences of its policies, this monitor is there too. As a result, the whole picture of development can be taken into account.

What happened to human capital in terms of education and health? What happened to natural capital, including many of the things we discussed today? What happened to social capital, trust in government and democracy, et cetera? And so, the day that the government goes to parliament, not only the economic consequences of policy is taken into account but at the same time, simultaneously, the other things. That is a big advantage and is also taken up in the media. There is no attempt to summarize all values in one number, but it is more like a dashboard.

On the non-linearity, I do not really know. I think it is important to present the ecosystem services separately, and do not do oversimplification.

Joseph Stiglitz: Can I ask one question that is related, which is does anybody ever calculate if climate change continues in the way it is going, what will happen to the natural capital of the Netherlands with such a large fraction of the country being underwater? You know, if you could calculate the consequences for the natural capital of your country, of what is going to be happening if you did not do anything and climate change proceeds? Has that calculation been done?

Bert Kroese: I think there are many studies in that direction, because part of our country is below sea level. Actually, the house where I live in the Netherlands is about sea level. I do not know if there is one definite number, but there are various models and studies. And it is not only the sea level, but also the rivers, that are flooding.

Eli Fenichel: On the alignment, fully agree, and if you look in the US national strategy, it is not coincidence that the goal is to release the annual numbers along with the -- I believe third quarter GDP is what we said -- for all the reasons that Bert has discussed. On the non-linearities, there is a fair bit of work. There are two kinds of non-linearity; there is sort of what I would call standard non-linearities that are important and that is like curvature, and then there is non-convexities, and I think there is more on the former than the latter.

One of the challenges of moving natural assets onto the national balance sheets is it is probably not reasonable to think about the total value of natural assets. However, changes in the value of natural assets can be measurable, because we know that small to moderate change in assets do have finite value. This notion that we can value changes for things, even though the things might be infinitely valuable if they went to zero. But we are not in a realm of where we are talking about going to zero, hopefully, right?

So, if we are talking about changes that are more marginal or more incremental, that is where the issue of how you build index numbers really matters. And that is the exact problem of when you have changes in prices and changes in quantities -- it is not a straight difference. And this has been known for 40, 50 years or more, right? And so those are the exact questions to be asking.

Mauricio Rodas: So precisely because of what Joe mentioned regarding the communitarian aspect of urban life, I think cities are very fertile ground for developing a natural capital accounting system -- because since there is this strong communitarian feeling. I think that for local authorities, it should be fairly easy to communicate the benefits about investing in nature by having these kinds of accounts. So, I think it can become a very strong communication tool for public authorities.

Now, the point is how to convince those public authorities to develop these kinds of systems. And the problem is that I think that many mayors around the world do not even know about this, or the

effectiveness that this could generate for them. So, I think it is also a communication effort that should be done with mayors. And I think that international organizations and city networks can play a vital role in doing so by demonstrating that, for example, developing these systems can, as I said before, not only help make the case about why it is important to invest in nature, but also to improve the shape of cities, to access finance, to attract more investment. I think that when you make that connection, it becomes really attractive, and mayors can be part of these kind of efforts.

Linda Bilmes: We will take next question.

Speaker 3: Yeah, I have a rural question. The focus on cities is quite interesting, but if any of the panelists could comment, the question of soils and soil fertility, is that better along than some other areas of natural accounting? Does it present special challenges of... Whatever you can say about soils and soil fertility, and it is of interest to cities as well.

Linda Bilmes: Eli has some expertise on expert on soil fertility

Eli Fenichel: I am not an expert on soil fertility, but I have worked with experts on soil fertility.

Speaker 3: Department of Agriculture.

Eli Fenichel: Yes, and outside experts as well.

Yeah. What I will say is no. I actually think soil fertility is lagging more than many others, and it is because soils are so complex. And one of the challenges that you see in just measuring things like soil organic matter is within field variation can be greater than between field variations. So, the technologies for doing the biophysical measurements that we have talked about -- that are advancing rapidly -- is an area that is like, three years, four years ago, when I was working with a team, and everyone was saying how hard that was. Now, people are saying it is hard, not super hard, and that is moving very quickly.

And then what we don't see are a lot of great arms-length markets in agricultural land, right? The markets are not super thick, like you would see in residential housing, right? The markets are much thinner when you are looking at it, so, there is not as much churn. A lot of it is rental and not well recorded and well reported. And so, the economic data are a little bit fuzzier than you would see in an urban setting, frankly, or a suburban setting on the economic side. And the biophysical measures of soil fertility are rapidly advancing. I would be optimistic, in say, five years out, we will be in a much better place. But I think right now the primary measure people are looking at is soil organic matter, or soil carbon, which are basically the same thing. Those measures are still really hard to do at scale repeatedly and reliably.

Joseph Stiglitz: Yes, I think this all comes down to what we are trying to measure here. Is it private values or social values?

If we understood well the relationship between the physical characteristics of the soil, and the fertility of the soil, then we can say how the (market) price should depend on soil fertility, because we know what can be produced at what costs, and therefore we know the rents on the land, and therefore, we know the value of the land, and how it varies with soil fertility. As it is, that may be different from actual market valuation. We know, too, that the value of land does not incorporate well, in many cases,

the risk of being underwater or being hit by a devastating hurricane. Thus, land values do not even incorporate well “private values,” but they do an even poorer job in incorporating social values— reflecting externalities on others, e.g. associated with water run-offs.

So, I think the evidence right now is strong that land markets are so flawed that in areas where we have good estimates of productivity or the destruction of climate change, we ought to use those estimates and not the market estimates. In doing so, we are in effect marking a correction for the obvious market failure of ignorance.

Linda Bilmes: I think we have time for one more question. Yes?

Wes Austin: Hi, Wes Austin, US Environmental Protection Agency. So given that there was an effort in the nineties in natural capital accounts that was sunk due to political opposition, I am wondering how we can ensure that the numbers that we are tracking right now in this current effort do not meet the same fate. And this also goes to other efforts abroad that might face political opposition.

Linda Bilmes: Thank you, that’s an important question about how do we politically insulate these efforts this time.

Eli Fenichel: So this is what I and my team have been thinking about for many months, and Joe was around the first time (in the early 90s), so I am curious what Joe has to say as well, because I have not talked to Joe about this. I have talked to other people who were there. What happened officially in the 1990s -- and I am going to give the official version that is in the congressional record -- is that Congress paused the BEA’s work on environmental-economic statistics and gave BEA \$400,000 to go get a peer review on the methodologies. That is “Nature’s Numbers,” which satisfied the congressional request -- and there have been multiple peer reviews, including a GAO report in 2007 that there were questions about a green GDP -- but the whole idea of environmental-economic statistics was something that the US should be moving forward on. So this all happened in 1992 to 1994, when the BEA first worked on environmental-economic statistics. The 1995 Paperwork Reduction Act was passed, creating the modern version of the Office of the Chief Statistician, which is in the Office of Management and Budget in the White House. The Chief Statistician has the authorities to coordinate across agencies and develop new statistical products. That has been delegated by Congress.

In 2019, just to confuse everyone, Congress passed the 2018 Evidence Act, but I have been always told that, to remind people it passed in 2019. This Act, again, changes the statistical system, and for the first time really elevates a lot of the natural sciences, so like EPA where Alex Martin is the statistical officer at EPA now. That is because of the Evidence Act, which basically allows elements within EPA, USGS -- that were not part of the statistical system -- to become part of the official statistical system, coordinated in the Office of the Chief Statistician.

So, while this does not guarantee that somebody will not throw a fit in Congress, Congress did overhaul the way the statistical system is designed since the first go around, and this is not BEA doing this. It certainly has the support of the Secretary of Commerce. And on Sunday, I am doing another panel specifically on the US strategy with Jed Kolko, the Undersecretary of Commerce, as well as some chief economists from other departments that are engaged in this. It is being run or overseen by the chief statistician, who has the authority from Congress to develop these new statistical products, including in the Evidence Act, which specifically calls for statistics related to the environment for the first time.

So yes, somebody in Congress could throw a fit, but now the legislation is much clearer than it was in the early 1990s.

Joseph Stiglitz: Yeah, I mean, it is always going to be difficult, and I think they have moved in the right direction. Obviously, if you have a president who does not want to... You know, like President Reagan did not want to talk about inequality, so he stops doing it. There are ways of, quote, "complying:" he appoints the wrong chief statistician and the frameworks and institutions that are created to try to move forward - there is no commitment. This 15-year plan is great, but it does provide momentum. It does expose any government that does not continue on in this line to having gone back on what was a plan and progress.

One of the things that is important here is that this has become an international effort. So having norms set by the IMF and the OECD makes any deviation by the United States or any other country more exposed, and that is all you can do. You can reveal that you are not complying with those international norms of collecting data. Then that raises questions, why do not you want to collect the data? And that becomes part of the politics itself. So, creating these structures does create a momentum, but it is not irreversible. And so, it is not perfectly insulated from either Congress or from the administration. But it has some momentum that I think is very positive, and particularly when there are international institutions that are moving along.

Linda Bilmes: Thank you all very much. On this final point, let me offer one anecdote from when I served as the Assistant Secretary of Commerce for Management and Budget in the 1990s. The National Weather Service, which is part of the Commerce Department, was modernizing and closing hundreds of field offices. These offices held a hundred years' worth of paper weather records from local weather stations all over the country. We requested funds to protect and digitize that information, but many Members of Congress didn't recognize the value of that effort. There just wasn't much awareness at that time that 100 years of weather records was actually valuable.

And even securing funds for modern computers at the Bureau of Economic Analysis was not easy, because some Members did not recognize the need to invest in improving and securing accurate data. But I think that since then, there has been progress in terms of cooperation, in terms of the global effort around this, and in data quality. We deliberately chose an international panel today that is leading these changes. As Joe said, the norms are changing around this issue, and hopefully that will benefit the outcome over the next few years.

<<session concludes>>