

PARDEE CENTER

# *Annual Review 2020–2021*

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## Letter from the **DIRECTOR**

### DEAR FRIENDS,

As the immediate shock of the COVID-19 pandemic eases and individuals, communities, and countries begin to emerge (albeit unevenly) from its shadow, urgent “grand challenges” await the global community. Between 50 and 100 million people have been pushed into extreme poverty and malnutrition by the pandemic, adding to the hundreds of millions already living in desperate need. The effects of climate change are increasingly clear, including droughts, floods, and other manifestations of extreme weather. Civil conflicts continue to rage, leading to the loss of all too many innocent lives, especially those of children. Democracy is losing its footing in various places around the world and geopolitical shifts are challenging long-held perceptions about how the international system is organized. The scope and multidimensionality of these grand challenges are daunting.

The vision of the University of Denver is to be a private university dedicated to the public good. One way that we, at the Pardee Center, attempt to support this vision is through the study of the kinds of grand challenges described above. We do this by producing data, tools, and analyses that are freely available to all and that aim to inform debates and policy decisions that advance the public good. This institutional mission-driven foundation is reflected in our research agenda and our outreach efforts. Examples are woven throughout this report, though I would like to highlight a few here:

- ◆ Our work with the United Nations improves decision-makers’ understandings of how to achieve sustainable development and the impact that conflict has on human lives.
- ◆ Our collaboration with the African Union Development Agency is helping to build widespread capacity to improve knowledge management through the use of analytic tools, with a current focus on studying how COVID-19 has impacted development across the continent.
- ◆ The data we build in the study of international relations improves understandings about changing patterns of geopolitical influence, pointing toward multilateral solutions to difficult problems.

Another way we strive to serve the public good is by supporting the University of Denver’s Josef Korbel School of International Studies’ dedication to helping prepare emerging leaders to tackle future grand challenges. We do this by providing rigorous coursework, meaningful research opportunities, and access to internships

and potential employers in policy-making organizations. In turn, our work is immeasurably enhanced by the commitment, new ideas, and passion of those students who support all aspects of our research.

In closing, I note that commitment to the public good is itself the expression of a deeply-held value. At the Pardee Center, that commitment is anchored by three additional values that reflect the way we approach our work and our external and internal relationships. Those values, articulated in our Five-Year Strategic Plan adopted last year, are interconnectedness, understanding, and integrity. You will see these values reflected repeatedly in various ways in the articles in this Annual Review.

I hope you enjoy reading about our work this past year—a year characterized by a new grand challenge in the form of the COVID-19 pandemic as well as persisting challenges. We hope that you will join us as we search for new ways to better understand the world around us in support of helping all humans live safely and fully in a world of complexity and uncertainty.



**JONATHAN MOYER**  
PARDEE CENTER DIRECTOR





**\$1.98  
MILLION**

IN SPONSORED RESEARCH

**4**

**NEW FULL-TIME  
TEAM MEMBERS**

**PARDEE** *by the* **NUMBERS**

**5**

**COURSES  
TAUGHT BY**

—  
**PARDEE CENTER  
FACULTY**

**21**

**SPONSORED PROJECTS**

—  
**WITH 9 CLIENTS**



**94**

**STUDENTS EMPLOYED**

—  
**FROM 5 UNIVERSITY OF DENVER  
COLLEGES AND SCHOOLS**



**16**

**FULL-TIME  
TEAM MEMBERS**

## UPDATE *on the* INTERNATIONAL FUTURES SYSTEM

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The International Futures (IFs) forecasting system is central to much of the Pardee Center's work, constantly helping us to understand, explore, and communicate the complex reality in which we live and the alternative futures that might be brought into being. Over the past year, main thrusts of model development included: (1) strengthening the model's representation of global crises (in this case, the COVID-19 pandemic); (2) enhancing analysis of progress toward the Sustainable Development Goals (SDGs); (3) improving our ability to analyze the pursuit of food security; (4) supporting data initialization; and (5) continuing to improve its User Interface.

The economic model continues to evolve. This year, model attention to the impact of COVID-19 led to elaboration of the relationship between productivity and capacity utilization and improvement in the relationship between trade openness and multifactor productivity. Attention to age-specific poverty of women was a focal point of model enhancement and use. We improved the initial data on poverty by changing our source to the World Bank's PovcalNET. Country-to-country representations continue to advance, including those of bilateral trade and remittances.



The agriculture module also was improved, with changes in the calculations of yields, land saturation, and trade. We added a new, alternative logic for the malnutrition calculation, now tied to income and therefore calorie distribution, and we also updated our stunting formulation.

Work progresses constantly on other models across the integrated system. For instance, enhancements were made to bilateral migration (with demographic and economic impacts) and to education. Other areas of attention were government debt; aid received as percentage of revenue; military spending; electricity access (urban and rural); and total fertility rate. Continued support of SDG analysis drove many improvements, including the modeling of maternal mortality.

The User Interface supports wide and growing use of IFs in scientific and policy analysis. This year, we enabled endogenous

economic growth for country-groups; standardized our catalog of country names; changed the base year of the model to 2017; and created a data sensitivity report. Enhancements were made to the bilateral, statistics, poverty, and driver displays. We improved the scenario tree and the help system. We reordered gender in displays to put women first. And finally, we continue to test and improve the translation of IFs to .NET in support of protecting the software's future utility and adding capabilities such as comparing newer forecasts with those made in earlier years.

**—JOSÉ SOLÓRZANO  
AND BARRY HUGHES**

## IMPLEMENTING *the* PARDEE CENTER STRATEGIC PLAN

### YEAR 1 FOUNDATIONS AND FOCI

Just over a year ago, the Pardee Center completed a year-long strategic planning process and last year's Annual Review discussed the resulting plan in some detail. Briefly, the plan affirmed the continued centrality of core components of the Center's work up to that time—namely, (1) understanding and modeling the interacting human, social, and natural system components of global change; and (2) encouraging and supporting strategic policy analysis. It also affirmed the continuing centrality of the International Futures system of models for that work, augmented as appropriate with other analytic tools.

At the same time, the plan identified areas for increased attention and emphasis: (1) expanding and improving the Center's participation in, and contributions to, external academic and scientific communities; (2) strengthening and expanding our connections “at home” within the Josef Korbel School of International Studies (Korbel School) and the University of Denver more broadly; and (3) developing internally with changes in Pardee Center governance, structure, and culture appropriate to our growth in size and the increased diversity of interests and capabilities of center personnel.



Our implementation activities over this past year—the first year of the Five-Year Strategic Plan—have focused primarily on providing the organizational foundation that is necessary for us to meet not only the internal goals articulated in the plan but also the goals in external arenas. Three positions were redefined as Assistant Director positions with increased responsibilities and shared authority, and a Leadership Team now meets regularly with a clearly defined role. In addition, five standing committees have been established to guide implementation activities.

Through the work of the committees, we have, among other things, developed and adopted an authorship guide for Pardee Center publications; defined types of

affiliations through which students, faculty, and community professionals may connect with the Center; mounted an onboarding program for new staff; and implemented an ambitious professional development program for full-time center personnel. Two projects in development stages are (1) establishing a Korbel Pardee Advisory Council (KPAC) to strengthen the Center's connections with the Korbel School; and (2) establishing guidelines for the creation of postdoctoral positions at the Center. You will find more information about many of these initiatives in various articles throughout this Annual Review.

—JANET DICKSON



# Strategic Plan Goals

## AND SUBGOALS

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### GOAL 1

**SHAPE A RESEARCH PORTFOLIO** that allows the Pardee Center to best build knowledge for future wellbeing.

*Project selection; active project development; personnel capacity; secondary project outcomes*

### GOAL 2

**EXPAND OUR CLIENT-BASED WORK** in a direction that enhances the Center's ability to support policy making.

*Scalable IFs user base; public presence; innovation; scientific foundation*

### GOAL 3

**EXPAND AND IMPROVE** the Pardee Center's participation in, and contributions to, academic, and scientific communities.

*Publications; personnel; funding; links and collaboration; internal activities*

### GOAL 4

**STRENGTHEN THE IFs SYSTEM**, linked to appropriate data and other Pardee Center tools, and enhance its long-term viability.

*The model; modeling team and personnel; processes; awareness, perception, and use*

### GOAL 5

**ENHANCE AND INCREASE STUDENT LEARNING EXPERIENCES AND PROFESSIONAL DEVELOPMENT.**

*Coursework; research opportunities; internships; alumni network*

### GOAL 6

**ENHANCE** the Center's **ORGANIZATIONAL CAPACITY AND FUNCTIONING** vis-à-vis its human resources, its governance structure, and its financial resource base.

*Personnel: recruitment; onboarding; professional development; career advancement. Governance: leadership team; assistant directorships; organizational structure. Financial resources: resource planning; pursuit of funding; resource stocks*

### GOAL 7

**ENHANCE** the Center's organizational capacity and functioning vis-à-vis **CENTER-WIDE PROJECT MANAGEMENT STRATEGIES AND PROCESSES, A ROBUST COMMUNICATIONS PLAN, AND A RESPECTFUL AND SUPPORTIVE WORK ENVIRONMENT AND CULTURE.**

*Project management: research projects; Center governance and operations; student work. Communications: internal communications; client communications; Korbel School and the University of Denver; external communications. Organizational culture: inclusivity; shared values; collaborative work environment; culture of gratitude*

### GOAL 8

**SEEK MODERATE GROWTH CONGRUENT WITH RESEARCH GOALS AND OPPORTUNITIES** within an environment of shared Center governance and decision-making and broader Korbel School and University support.

*Positions; space; DU and Korbel School role articulation; Korbel School research*



## INTERNATIONAL *Futures* EDUCATION

### TEACHING IN A TIME OF CRISIS

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We all faced unprecedented challenges this past year from the COVID-19 pandemic, social unrest, and economic uncertainty. Faculty at the Josef Korbel School of International Studies who teach coursework related to the International Futures (IFs) model, along with every educator, were required to modify teaching methods to incorporate health and safety requirements while also addressing the socioeconomic challenges impacting our community. To meet these challenges, faculty affiliated with the Pardee Center incorporated new teaching methods, technologies, and health/safety protocols. New teaching methods included hybrid (i.e., use of synchronous and asynchronous content), hyflex (i.e., both in-person and remote students interacting in real time), distanced (i.e., fully teleconferenced instruction), and socially-distanced and masked in-person

instruction to support graduate and undergraduate courses focused on learning the IFs modeling system. Faculty leveraged recorded videos and other asynchronous content created prior to the pandemic, while also including recent forecasts developed by the Pardee Center identifying the broad impacts from the COVID-19 pandemic. The additional content along with the technology-enhanced teaching methods also helped facilitate multiple training sessions conducted by Jonathan Moyer and David Bohl with our external partners, including the United Nations Development Programme.

Looking forward, and as part of the Center's long-term goals, we will launch an Education Committee in the new academic year to holistically evaluate and revise curricular offerings relevant in teaching IFs, quantitative methods, and forecasting techniques. The goal is to develop approaches that will best enable our user community to think strategically about the major challenges we all will face in the years to come and to empower positive change. Be they the students at the University of Denver, our external partners, or our talented and diverse staff, the Pardee Center regards teaching, learning, and personal development as fundamental goals of our mission. In the months and years ahead, we aim to realize this goal on behalf of all our stakeholders, and in so doing, further advance the mission of the Pardee Center itself.

—KEITH GEHRING

## *Korbel-Pardee* **ADVISORY COUNCIL** *(KPAC)*

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The Pardee Center shares with its host, the Josef Korbel School of International Studies (Korbel School), a commitment to producing academic research with impact, engaging students in a broad range of learning opportunities, and interacting with policy communities and other constituents in the public arena. Over the past year we have taken a number of steps to enhance our engagement with the School, including by participating on the Korbel School research and staff councils, supporting numerous outreach initiatives to connect with first-year Master's students who began their studies remotely during the COVID-19 pandemic, and facilitating virtual panel events engaging subject experts at the Korbel School in conversations around our research.

We are especially pleased that a standing Korbel-Pardee Advisory Council (KPAC) is now being formed. The purpose

of the KPAC is to extend and enhance both the mission-driven relationship and the organizational/administrative connections between the Korbel School and the Pardee Center. At the onset, a central component of that purpose will be increasing understanding throughout the Korbel School of the work and expertise resident at the Pardee Center. As that understanding develops, a second central component will be increasing scholarly collaborations between the Center and Korbel School faculty and staff across teaching, research, and public outreach activities to the benefit of both the Pardee Center and the Korbel School more broadly.

KPAC members will include Korbel School faculty representatives, administrative staff (including one or more from student-serving

offices) as well as Pardee Center representatives (the Assistant Directors responsible for finance, operations, and research analysis). The Council will meet quarterly and will be co-chaired by the Director of the Pardee Center and a rotating Korbel School faculty member. The first meeting will take place during fall term 2021.

—JANET DICKSON



# Interconnectedness, Understanding, *and* Integrity

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In this section we highlight our work with clients over the past year as well as major internal research-supporting activities and Pardee Center committee work focused on organizational priorities. A similar section in last year's Annual Review was organized by the major foci of our research: patterns of human development; patterns of societal development; and interactions between human, social, and biophysical systems.

This year we are organizing the articles according to the three values articulated in our Five-Year Strategic Plan to describe "the way we work." Those values are interconnectedness, understanding, and integrity. In our plan, we describe each of them as follows:

## **INTERCONNECTEDNESS:**

Bringing together ideas and people to build knowledge

- ◆ We analyze the world as a deeply connected system by bringing together insights from multiple academic fields.
- ◆ We interact with policymakers, academics, and students to build and support communities of users of our data and models and to broaden our own perspective.

## **UNDERSTANDING:**

Mapping and measuring how the systems of the world interact

- ◆ We strive to better understand, represent, and communicate how human, social, and natural systems dynamically interact.
- ◆ We work to make our complex models transparent and intelligible.

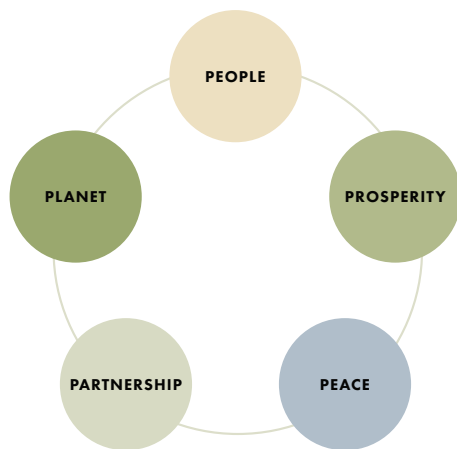
## **INTEGRITY:**

Committing to openness, honesty, and trustworthiness

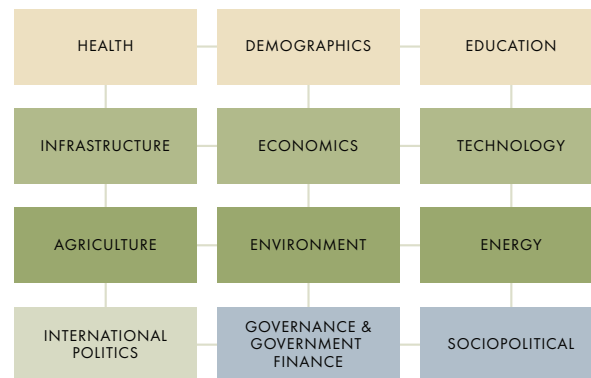
- ◆ From our modeling assumptions and tools to the way we work with others, we strive to be as open and accessible as possible.
- ◆ We deliberately communicate the limitations of our work as well as its strengths.

Many of the articles that follow could have appeared as examples representing two or even all three of the values. While the way the articles are sorted here is therefore somewhat arbitrary, our intent to have all three of them guide every aspect of our work is a sincere one.

—WHITNEY DORAN



**SDG 5Ps**



**IFs SYSTEM MODELS**

## *Interconnectedness:* Bringing together ideas and people to build knowledge

At the core of the work of the Pardee Center is the concept of interconnectedness. Our goal has always been to understand, represent, and share knowledge about the interacting human, social, and biophysical system drivers and consequences of global change. In 2015, the United Nations member states adopted a 2030 Agenda for Sustainable Development built on a similar recognition of the interconnectivity of key global issue areas, a recognition that often did not characterize analysis and planning of past development efforts.

The 2030 Agenda sets forth 17 Sustainable Development Goals (SDGs) with 169 associated targets grouped in clusters around “5Ps”—namely, People, Planet, Prosperity, Peace, and Partnership. As the color coded figure above shows, models of the Pardee Center’s International Futures (IFs) modeling and forecasting system connect with the clusters represented by the 5Ps.

Because of these conceptual connections and the large number of variables represented in the IFs system, the Pardee Center is increasingly recognized for its unique SDG analysis capabilities. The

articles that follow in this section describe Pardee Center sponsored projects over the past year that gave explicit attention to various SDG goals. Our clients included the United Nations Development Programme (7 research projects), USAID (2 projects), and the Atlantic Council (1 project). Across these projects we focused our analyses on a total of 10 SDGs (see figure to the right) with an emphasis on the key interconnected and interacting components associated with their trajectories over time.

—BARRY HUGHES

UNITED NATIONS  
*Sustainable Development Goals*  
ANALYZED BY THE PARDEE CENTER IN 2020–2021

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**UNDP GLOBAL**

Build capacity within UNDP to support country-level analysis of COVID-19 effects using International Futures

**UNDP REPUBLIC OF YEMEN**

Study on the impact of war on development in the Republic of Yemen

**UNDP EGYPT**

Study on inclusive COVID-19 responses

## UNDP PROJECTS

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With a central focus on achieving the Sustainable Development Goals (SDGs), the United Nations Development Programme (UNDP) takes an integrated approach to sustainable development that closely aligns with the International Futures (IFs) model's interconnected nature. In the past we have worked with UNDP to assess prospects for achieving the SDGs at country, regional, and global levels. Throughout the last year, our partnership with UNDP allowed us to share our work with a larger audience of policymakers and stakeholders while extending the application of IFs to answer more complex questions. We explored prospects for achieving the SDGs in a world altered by COVID-19 at country, regional, and global levels. We expanded our understanding of conflict and development through subnational analysis and a focus on post-conflict recovery. And through a series of virtual training and capacity building sessions, we broadened our reach to UNDP offices across the world. To the right, we highlight some of our recently completed and in-progress work.

**UNDP GUINEA-BISSAU**

Analysis on the cost of not going green in Guinea-Bissau

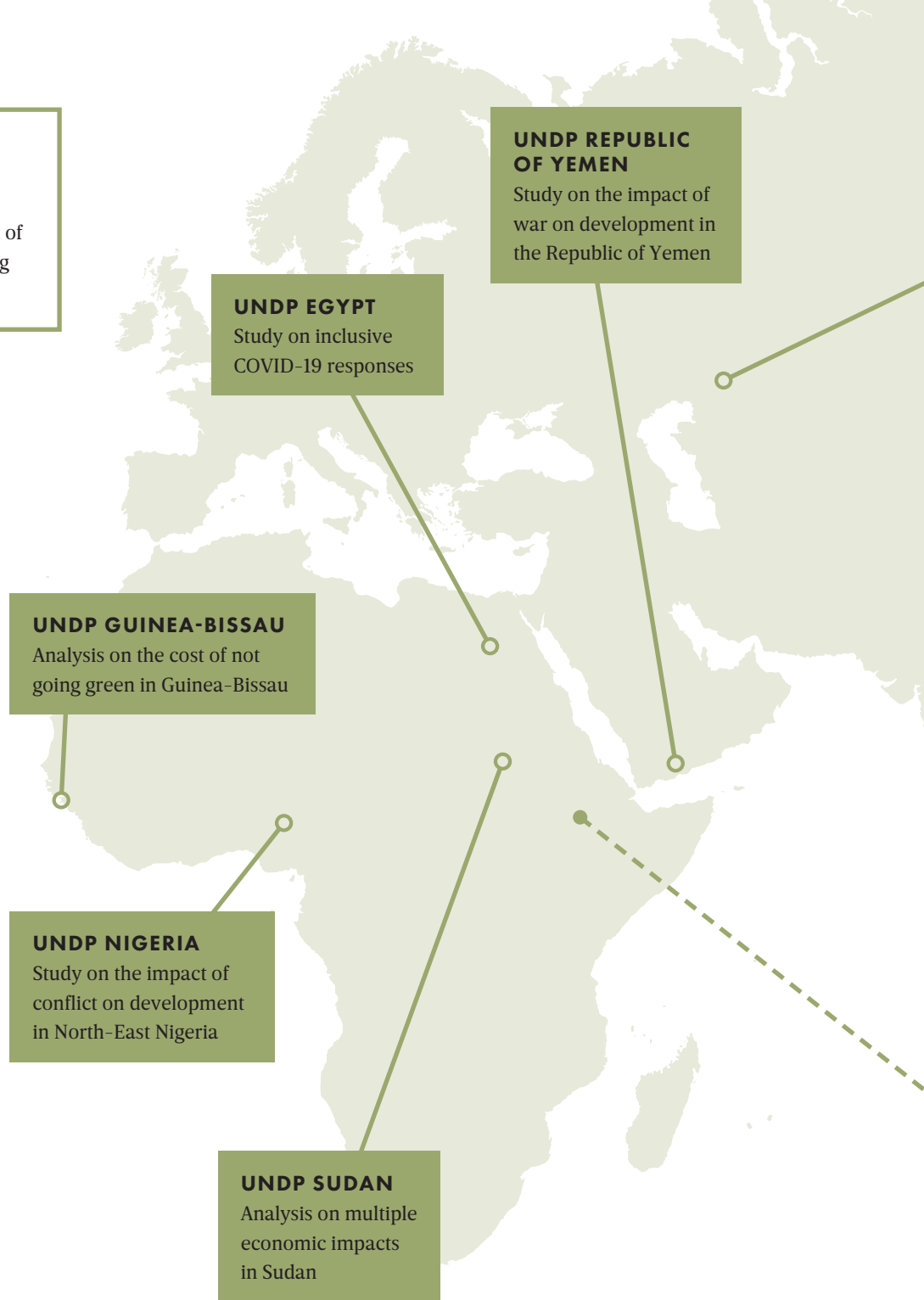
**UNDP NIGERIA**

Study on the impact of conflict on development in North-East Nigeria

**UNDP SUDAN**

Analysis on multiple economic impacts in Sudan

—TAYLOR HANNA





**UNDP CENTRAL ASIA**

Analysis of COVID-19 policy responses and trade-offs in Central Asian countries

## USAID FOOD SECURITY

Food security is a human right, but for many today it remains an unrealized right. A Pardee Center team, led by Research Scientist Willem Verhagen with support from the National Opinion Research Center (NORC), developed a report that investigates the long-term impacts of COVID-19 on food security to the year 2040 at world and world-region levels. The report quantifies the multi-dimensional nature of food security by assessing the effect of COVID-19 on extreme poverty, undernourishment, and child stunting out to 2040, and by assessing the effects on underlying drivers of food availability, economic access, and food utilization. The project also explored the impacts of climate and conflict on food security.

Using the International Futures (IFs) tool, analysis found that the world is set to make progress in reducing extreme poverty, undernourishment, and child stunting between today and 2040. However,

COVID-19 is resulting in a multi-year setback on progress across all these indicators, relative to a world without COVID-19. Specifically, COVID-19 is resulting in uneven outcomes with disproportionate negative effects in sub-Saharan Africa and Southern Asia. The primary effects of COVID-19 on food security operate through reduced economic size, demand side reductions, and lower economic food access. Also, over time, reduced investment in agriculture negatively impacts domestic food availability while reduced investment in water and sanitation as well as lower educational attainment negatively impact food utilization relative to a no-COVID-19 scenario.

This project focused on Sustainable Development Goal (SDG) 2 (Zero Hunger), but through the multi-dimensionality of food security, the report provided insights also on COVID-19's implications for SDG 1 (No Poverty), and SDG 3 (Good Health and Well-Being). The work conducted on this project provides an important resource for policy development to help mitigate the impacts of COVID-19 on long-term food security.

—IRIS NOTT & WILLEM VERHAGEN

**UNDP REGIONAL BUREAU FOR AFRICA**

Sub-regional study on the socioeconomic impact of COVID-19 in Africa



## USAID UKRAINE

In association with EnCompass LLC, a Pardee Center team provided technical assistance related to assessment of USAID Ukraine progress toward meeting the Country Development Cooperation Strategy (CDCS) development objectives (DOs) through 2024. DOs 1 and 3—“corruption reduced in target sectors” and “democratic governance strengthened”—provide short-term benchmarks on the way to the Sustainable Development Goals’ (SDGs) 2030 target for Goal 16—“Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.” Meanwhile, DO 4—“inclusive, sustainable

market-driven economic growth”—blends elements of several SDGs, particularly Goals 8 (Decent Work and Economic Growth), 11 (Reduced Inequalities), and 12 (Responsible Consumption and Production).

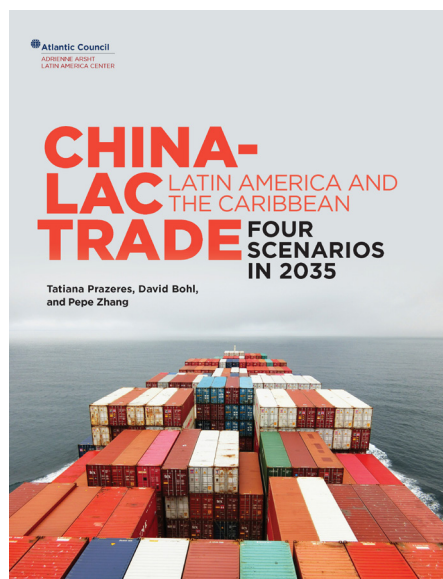
Thus far, the Pardee Center team’s assessment has included the development of a conceptual and scenario analysis framework that ties CDCS DOs and Performance Monitoring Plan indicators to variables and parameters within the International Futures tool. We look forward to the application of this framework and other analytic approaches as needed by the mission in coming years.

—COLLIN MEISEL

## Atlantic COUNCIL:

WHAT MIGHT THE YEAR 2035  
BRING FOR CHINA'S TRADE WITH  
LATIN AMERICA?

Over the past decades China has emerged as one of the world's largest producers and consumers of globally traded goods. This is perhaps most notable in Latin America and the Caribbean (LAC) where China grew from an almost negligible presence to the region's second largest trade partner. To better understand how trade between China and LAC might look by 2035 and, by extension, how a partnership like this may relate to Sustainable Development Goal 17 (Partnerships for the Goals: Strengthen the means of implementation and revitalize the global partnership for sustainable



development), this report explores four possible futures, differing in terms of economic growth and the strength of trade relations. It highlights several enduring trends, such as LAC's growing dependence on China or the diminished role that agriculture is expected to play in their exchange, some surprising possibilities such as China overtaking the United States as the region's top trade partner, and several other insights related to the changing patterns and balance of trade among partners and within sectors. The report was sponsored by the Atlantic Council and written in cooperation with Atlantic Council colleagues Tariana Prazeres and Pepe Zhang.

—DAVID BOHL

## UPCOMING *Project Profiles*

*In the next year, we look forward to pursuing the following projects among others!*

### USAID

National level analysis in Uganda to support next Country Development Cooperation Strategy (CDCS) process

### EUROPEAN COMMISSION

Enhancing capacity for forecasting and scenario analysis of sub-national development trends in Uganda using International Futures

### UNDP GLOBAL

Enhancing the International Futures platform for improved gender-aware forecasts

## *Understanding* Mapping and measuring how the systems of the world interact

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Over the past four decades, the International Futures (IFs) modeling project has worked to catalogue, integrate, and expand understanding of how human, social, and natural systems evolve and interact over long time horizons. The model and the database underlying it have expanded significantly over this time, and the Pardee Center—its size, structure, and activities—have grown alongside. Today we have a specialized resource team dedicated to the maintenance of the IFs historical database and its use and a second resource team dedicated to reviewing the scientific literature that serves as the foundation for the causal relationships and forward linkages in IFs. Articles in this section describe the work of both teams. A third article in this section focuses on model documentation,

necessary obviously for full understanding of the IFs system by interested users and by those working to understand, improve, and extend it.

Over the past decade, Diplometrics, a program intended to expand understanding and quantification of international relations has emerged as a second focus of the Center. Initially as a data-building project and now through increasingly sophisticated analyses, Diplometrics has contributed to Global Trends Reports from the National Intelligence Council, Presidential Briefs, and public conversations surrounding the current shape and future of the international system, as well as to the growth of the Center. Articles about the Diplometrics project in this section include an overview, some output measures, a description of

recent analytic work, and a spotlight on an area of recent emphasis (“Country and Organization Leader Travel”).

Over the coming decade, one focus for the Center’s work will be increased integration of the Diplometrics data and analytical structure into IFs, expanding upon the current integration of measures of material capabilities and bilateral influence capacity.

—DAVID BOHL

## LITERATURE *Review Team*

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Literature review is an important component of any research initiative. At the Pardee Center, we rely on literature review not only for our direct project research questions (e.g., what are the effects of conflict on development?), but also on the metaquestions we need answered in order to complete the research (e.g., how do we think about and model conflict and its consequences?).

A Pardee Center Literature Review Resource Team was put in place several years ago to more efficiently tackle project-related research questions. Made up of a small group of undergraduate and graduate Research Aides, the team works with researchers across the Pardee Center on a wide variety of projects, producing everything from in-depth systematic literature reviews to annotated bibliographies to providing quick answers to more narrow questions posed by Pardee Center staff.

Of course, the process is rarely as simple as answering a single question. Literature Review Team members work with Pardee Center staff to refine more ambiguous questions and to address new questions as they arise in a project. These questions can address development of the IFs model, scenario building, how to frame results within

a specific context, important ideas that IFs is not suited to represent, and how to best communicate project results. In fact, one could learn a lot about the evolution of a research project at the Center from reviewing the team's literature review questions and assignments.

From providing regular updates on the evolving COVID-19 situation in several countries to diving into the academic literature supporting our model linkages, the Literature Review Resource Team has played an important role in the majority of the research projects at the Pardee Center over the past year.

—TAYLOR HANNA

## *International Futures* **DATA Team**

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Data is one of the fundamental elements of the International Futures (IFs) system and its well-maintained database, with approximately 5,000 series and extensive historical coverage, provides sustainable support for the IFs modeling process and for more general exploration of global change over time.

The integrated database of the IFs system, made consistent across the countries and other geographical representations of IFs,



is routinely updated and extended with the latest available information from a very wide range of both open access and licensed sources. Data updates are done through a cross vetting process—collection, formatting, and vetting of data are always handled by two Research Aides under the supervision of a team Project Lead. In addition, on-demand data requests from ongoing projects, which normally involve data exploration through manipulation and analysis, are prioritized and processed based on delivery dates and team capacity.

During this past year, the team continued to: (1) standardize the documentation of data collection guidelines through reviewing and formatting the data dictionary; (2) integrate data distribution processes with an online project management tool; (3) formalize a team onboarding process for new members; and (4) conduct weekly training sessions to improve team capacity in data skills such as Python and SQL. Through these efforts, the team seeks to support data integrity in terms of data quality, communication transparency, and sustainable management.

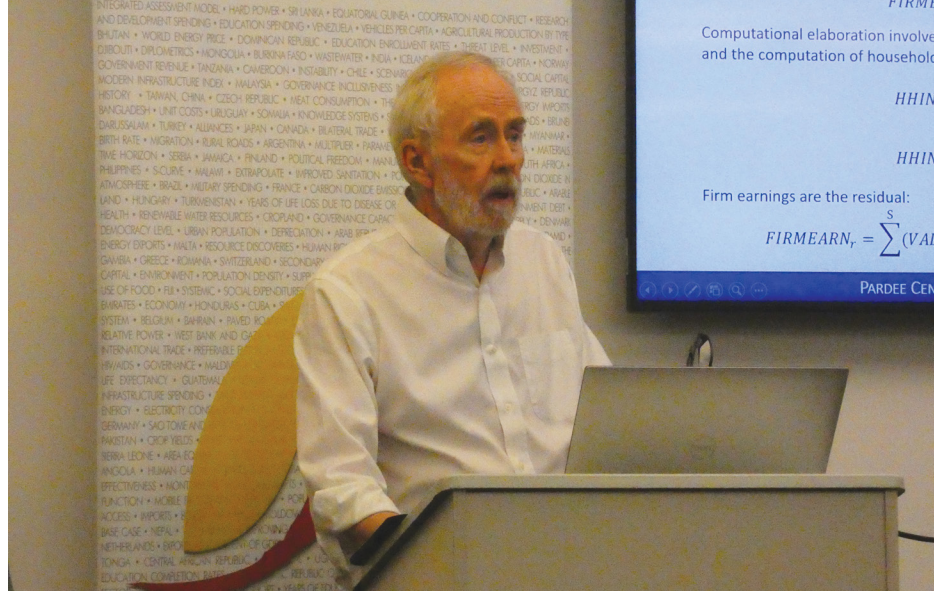
In addition to data management, another focus of the team is student development. In the last year, members of the team gained substantial experience in usage of the IFs system and have contributed to many projects across the Center.

—YUTANG XIONG

## *International Futures MODEL Documentation*

Model documentation is critical to understanding and evaluating the inputs and results of any modeling effort. With respect to the International Futures (IFs) system, documentation is important for three groups of people: (1) direct users of the IFs system around the world; (2) those who rely on analyses prepared by others; and (3) new members of the IFs team. Connecting documentation to understanding for these groups means that in addition to explaining blocks of code, the theoretical and empirical literature bases and data foundations of the model(s) need to be included.

All the models within IFs have associated documentation in two interacting forms: (1) continuously evolving working documents that integrate information about each model across its subcomponents; and

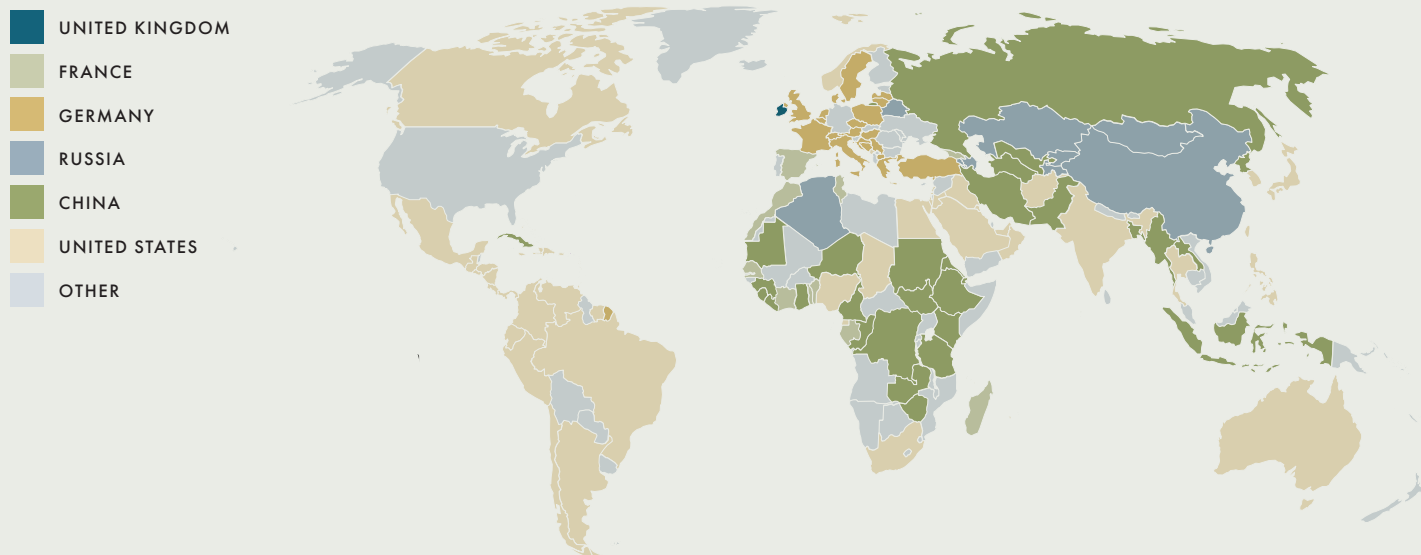


(2) GitHub files that provide “bite-size” on-demand pieces of that documentation both for generally interested individuals and for those actively using IFs. However, rapid development of the models within IFs in recent years has outpaced the updating and extension of documentation.

In recognition of the role that documentation plays in understanding (and also in transparency and trust), major efforts are now underway to bring IFs documentation up to date. Because of recent enhancements to the economic model, and also because it sits at the hub of many interactions among other models in the IFs system, current efforts are focused on updating documentation of the economic model. Other priorities include attention to bilateral representations beyond those for trade and agriculture, where recent improvements are now supporting projects concerning nutrition.

Also important, within the past year the procedures for generating and updating the GitHub files have been enhanced and themselves documented.

—BARRY HUGHES



## DIPLOMETRICS

### *Overview*

The Diplometrics Program at the Pardee Center seeks to better understand and measure relationships in the international system by integrating three key efforts: data gathering; tool building; and analysis. The project focuses on international interactions that measure the depth and breadth of political, diplomatic, economic, security, and cultural ties between countries.

Diplometrics began as a data building and analysis project in 2011, focusing initially on developing and forecasting the first iteration of the Global Power Index—a measure of national power featured in the National Intelligence Council’s Global Trends 2030 report—and then measures of diplomatic representation, membership in international organizations, and

signing and ratification of multilateral treaties. Since then, the Diplometrics Program has expanded significantly to include data on military capabilities, non-state actors, foreign travel by heads of government and state, diplomatic capacity, cultural affinity, power projection, and other data initiatives.

With this past year’s completion of our Global Indicators of Dyadic Engagement dataset, we have begun to use the combined data to analyze and forecast bilateral and networked influence across the international system. Additionally, we have utilized our Formal Bilateral Influence Capacity Index, which is built in part from core Diplometrics data series, to launch a report in association with the Atlantic Council focusing on China-U.S. competition

in Southeast Asia and implications for U.S. foreign policy.

Over the years, the Diplometrics Program has been funded by: the U.S. Army Future Studies Group; the U.S. Army Research Office; the U.S. Department of Defense Minerva Research Initiative; and other partners. Along the way, hundreds of students have contributed to the Diplometrics Program in meaningful ways. As our work moves forward, their continued support will ensure our center continues to develop original analyses and advance conversations in the international relations space among policy-makers, academics, and the public.

—COLLIN MEISEL

## DIPLOMETRICS *by the* NUMBERS

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### COUNTRY & ORGANIZATION LEADER TRAVEL

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Recorded nearly 3,000 international trips by world leaders from 2019 through the middle of 2021

More than 100 new leaders added to our list of more than 3,000 world leaders from more than 200 countries and major international organizations



### UNITED NATIONS GENERAL ASSEMBLY, SECURITY COUNCIL, AND HUMAN RIGHTS COUNCIL

---

More than 200 new votes recorded



### DIPLOMATIC SERVICES

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250 Diplomatic Lists totaling more than 20,000 observations for missions from over 200 countries and international organizations



### FORMAL BILATERAL INFLUENCE CAPACITY

---

History and nowcast of the Formal Bilateral Influence Capacity Index (FBIC) for over 40,000 country-pairs from 1960 through 2020



### INTERNATIONAL NON-GOVERNMENTAL ORGANIZATIONS

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More than 100,000 observations across 12 variables for 90 programmatic INGOs operating between 1990 and 2019



### PERCEIVED MASS ATROCITIES

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Recorded over 300 country-years of perceived mass atrocities across more than 100 distinct events, an effort which we expect will serve as the foundation for the world's first dataset on all known lethal and nonlethal atrocities committed since the end of the Cold War



## ANALYTIC WORK *with* DIPLOMETRICS DATASETS

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The Diplometrics Program leveraged its wealth of data collection projects to progress a number of academic works relevant to the fields of political science and international relations. Unfortunately, travel restrictions imposed as part of the COVID-19 pandemic impacted our staff's ability to engage in face-to-face academic conferences. However, staff had the opportunity to engage in virtual conferences and workshops, which allowed continued development of project manuscripts and our personnel. For example, Austin Matthews, Research Scientist, participated in the Responsible Public Engagement Institute hosted by the Sié Chéou-Kang Center at the University of Denver. This workshop helped participants to better think about the ethical considerations and importance of public engagement with the policy world.

With respect to project manuscripts, Jonathan Moyer, Austin Matthews, Jen Evans, John McPhee, and Whitney Doran launched a manuscript exploring the state-level drivers that help programmatic international nongovernmental organizations (INGOs) select where to operate worldwide. The work finds evidence that INGOs pursue opportunities to “do good” in countries with need while also adjusting their efforts based on considerations such as worker safety and organizational rights in the host state. Jonathan Moyer, Collin Meisel, and Austin Matthews also produced

a working manuscript that introduces a new index for measuring national power in the world, which they then use to forecast scenarios about the future of Chinese and American power in the coming decades. The Diplometrics Team looks forward to launching a number of peer-reviewed submissions in the coming year and continuing to support the Pardee Center's mission of meaningful engagement with the academic community.

—AUSTIN MATTHEWS

### PROJECT *Spotlight*

#### COUNTRY AND ORGANIZATION LEADER TRAVEL PROJECT (COLT)

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Already well-established in the Diplometrics Program, the Country and Organization Leader Travel (COLT) project expanded its coding efforts in two ways this year. First, Heads of Government and State (HOGS) travel, previously coded annually with quarterly deliverables, is now updated and made available monthly. Second, we embarked on a pilot effort exploring the feasibility and utility of coding the travel of sub-HOGS (i.e., full cabinet-ranking ministerial positions). As COLT seeks to understand how leaders—and by extension, their related countries and economic systems—interact with one another, the question posed in the expansion effort was the impact, or potential impact, ministerial-level positions could also have on the global sphere.

In terms of personnel, the COLT Project experienced rapid expansion over the past six months, increasing in size from six

Research Aides (RAs) to nearly 40 part-time RAs working as coders, vetters, and Project Leads, and hiring one full-time staff member with another position in progress. The project continues to focus on live coding updates with the broader COLT team divided into four sub-groups. One of these groups has as its primary objective the goal of updating the HOGS dataset on a monthly basis. Another group focuses particularly on monthly back-coding, ensuring that the quality of data in the COLT dataset is of the highest caliber possible. A third group of RAs has undertaken several data vetting initiatives and expanded our travel data series to include three additional variables for greater clarity on exiled leaders and territorial controls. Finally, the last of the four RA groups is solely dedicated to the sub-HOGS expansion pilot, examining the geographic spread, socioeconomic variety, and historical availability of data through two cohorts of countries.

COLT's efforts continue to contribute to larger discussions and hypotheses regarding how various social systems interact with one another. Our Research Scientists and Research Associates continue to conduct analyses on conference attendance, trade relations, economic aid, humanitarian assistance, and other variables that may overlap with HOGS and sub-HOGS international travel.

—ANJALI MARTIN

## *Integrity:* Brokering knowledge at the science-policy interface

Most of the work at the Pardee Center is directly situated at the interface of science and policy. As such, our work requires a balance between, on the one hand, the independence of an academic institution and, on the other hand, the action-orientation objectives of government agencies and nongovernmental organizations operating across the globe.

Managing this balance is a core process inherent in our daily work. It typically requires an iterative process of actively engaging with partners on framing the scope of the research, openly conveying research decisions and information about the overall approach, effectively communicating the research results with appropriate limitations, and reflecting on the subjective values that all of us bring to the table. While often tempting, it also means we need to refrain from prescribing policy. As such, striking that balance and continuously working on a shared understanding of our research means integrity must be at the heart of what we do as a Center. The article in this section about our collaboration with AUDA-NEPAD and excerpts from a communication from Martin Bwalya, Head of the Africa Union Development Agency Centres of Excellence,

speak to this balance and the importance of explicit attention to it.

Another central component of integrity in our work is transparency. As the articles in this section highlight, externally we work to enhance our transparency through maintaining an open-source model that is accessible to both technical and non-technical users and through trainings in the appropriate use of the International Futures model (as well as through model documentation, discussed in the section on Understanding).

Similarly, transparency, and integrity more generally, are enhanced internally by creating a shared understanding of values and translating those values into the way that we work together as a Center. Articles highlighting the work of two committees formed during the past year (the Academic Affairs Committee and the Human Resources, Governance, and Financial Resources Committee) demonstrate not only the Center's increasingly shared governance model but also its commitment to development of Center staff and furthering a culture of recognition and respect.

—WILLEM VERHAGEN



”  
**Striking that balance  
and continuously  
working on a shared  
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our research means  
integrity is at the  
heart of what we  
do as a center.**

# POLICY *and* DECISION MAKING IN CHALLENGING TIMES:

## PARDEE AUDA-NEPAD COLLABORATION

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Policymakers are today presented with intertwined challenges across an array of multifaceted sectors. Previously, policymakers might address problems in siloes, developing policies focused on the economy, security, agriculture, and other sectors. However, this siloed policymaking is now recognized as a hurdle to a country's development given the interconnectedness of human life and activities globally. Instead, integrated policymaking is preferred as it allows policymakers to minimize unintended consequences of policies across interconnecting sectors.

The complex world that policymakers find themselves in today has made them increasingly turn to science or data driven evidence to craft informed policies and decision-making for improved human welfare. The interaction between policy and science is what has come to be known as the science-policy interface. More than any other year, 2020 presented policymakers across the world with

### ABIGAIL KABANDULA

Visiting Teaching Assistant  
Professor and Director of the  
Africa Center, Josef Korbel  
School of International Studies,  
University of Denver

multiple competing and interconnected challenges which necessitated a science-policy interface as the COVID-19 pandemic ravaged health and economic sectors while severely impacting other areas such as livelihoods and mortality.

At the Pardee Center, we work with policymakers and analysts from states, international organizations, and think tanks to facilitate informed policymaking. Notably our work with the African Union Development Agency (AUDA-NEPAD) in 2020 culminated in a report titled COVID-19: The Future of African Development Systems in which we introduced a systems framework to assist decision-makers in thinking about the long-term effects of COVID-19 on development and the pursuit of the Sustainable Development Goals and Agenda 2063 in Africa. Together with the systems framework and alternative



### MARTIN BWALYA

HEAD OF THE AFRICAN UNION  
DEVELOPMENT AGENCY  
CENTRES OF EXCELLENCE

### ORGANIZATION

*African Union Development  
Agency (AUDA-NEPAD)*

### VISION

Harness knowledge to deliver the  
Africa we want.

### MISSION

Provide a platform to foster the  
development of the continent through  
effective implementation of Agenda  
2063 by leveraging partnerships and  
technical cooperation.

### Q&A | We asked long-term Pardee Center partner, Martin Bwalya, how does IFs and collaboration with the Pardee Center fit into AUDA-NEPAD's mission and vision?

Martin: Knowledge is AUDA-NEPAD's prime commodity in its work to catalyze and support implementation of Africa's Agenda 2063. In that regard, the IFs model and the Pardee Center have been extremely and uniquely valuable with respect to forecasting. Forecasts of different outcomes in differing circumstances have added an important dimension to African Union member states to ensure informed policy and investment choices.

scenario forecasting, the report provides African policymakers with ways to understand the long-term effects of COVID-19 on interconnected aspects of government and human development. The report continues to be a key resource for African policymakers, our AUDA-NEPAD partners inform us, as Africa grapples with the pandemic and the new Delta variant sweeps through the continent leaving high mortality rates, gripped health systems, shrinking economies, and weakens governance and democratic institutions.

We have faced modeling challenges dealing with a major disruption characterized by great uncertainty and unfolding quickly over a short period of time. In addition to the significant challenges of modeling and forecasting an unprecedented global event, the fast evolving COVID-19 pandemic in 2020 and 2021 highlighted another challenge in our modeling—namely, that our forecasts focus on regional and national rather than subnational levels whereas the effects of COVID-19 in Africa vary at the subnational level as well given the diversity in measures to curb the spread of the pandemic. Indeed, Africa is an immensely diverse continent with significant variation among its people, culture, language, economies, geography, and governance systems. Thus, our analyses at the continental, regional, or national levels could be enhanced by studying nuances at the subnational levels unique to each country or region as we support informed policies in this dynamic, complex world.

—ABIGAIL KABANDULA



## *International Futures* **OPEN SOURCE**

The Pardee Center has long believed that models should be open for others to use and to fully understand. Making the International Futures (IFs) model fully and freely available for use by others—a practice that is far from universal in modeling communities—has been our standard practice as open source code supports more accurate, accessible, and collaborative social science. Over the past year, the Pardee Center initiated major projects to further increase the open source accessibility of IFs and to make transparent its development roadmap. We are also preparing to share the code for the Center’s data visualizations.

All IFs source code is now stored on GitHub, a platform for storing and collaborating

with others in understanding and building code. Once internal proprietary code and data are removed, the IFs model system will become a fully open source project. This will open the door for more transparency and public participation and contribution than ever before.

Additionally, the Pardee Center has converted the IFs error reporting system into a publicly visible list of known issues and desired new or enhanced features. This opens error reporting to the public and also allows all users and project clients to know about desired or needed changes in the system. As a result, the Pardee Center team will better know what internally undiscovered issues exist as well as have more

awareness of desired feature enhancements, further advancing use of IFs and collaborations around it in the broader public sphere.

Beyond IFs, the Center's Data Visualization and Analysis Team has committed to placing all code used for data visualization projects into publicly available GitHub repositories. This new endeavor builds on the long-term vision of the Data Visualization Team to contribute knowledge and code to broader academic and scientific communities and to advocate, by example, for increased openness in academic and policy-oriented research.

—CORY VANDENBURG

## *International Futures* TRAINING

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For the last eight years, I have had the pleasure of supporting and leading training on the International Futures (IFs) model for governments, organizations, and students across four continents and over a dozen countries. It is fairly safe to say that in the last year, more people have participated in an IFs training than the sum total in the past eight years.

Whether it is about teaching a small number of technical staff how to use the tool to support their organization's objectives or merely exposing a conference room of practitioners and policymakers to a new way of thinking about the long-term integrated patterns of human development, IFs trainings have traditionally been hands-on, in-person engagements aimed at building capacity. However, this past year, due both to the restrictions imposed by COVID-19 and the enhanced technologies available

for large-scale virtual interactions, the IFs training audience expanded substantially. In July 2020, Pardee Center Director Jonathan Moyer addressed approximately 200 curious learners from around the world in the first of three live on-line IFs trainings aimed at showing the United Nations Development Programme (UNDP) community how an integrated assessment model like IFs could be used to assess the impact of COVID-19 on the Sustainable Development Goals.

Each of the three trainings, and the one-on-one virtual office hours that followed, introduced participants to a new way of thinking about and quantifying not just the long-term impact and uncertainty associated with the COVID-19 pandemic, but also the opportunities that still exist to carve out a more peaceful, prosperous, and sustainable future. From a digital lectern in his home office, Jonathan, with support from several Pardee Center staff and UNDP coordinators, fielded questions about the use of data in analysis, modeling approaches, and, of course, the IFs system. Even though the last office hour of the final training was in May 2021, that particular engagement continues on a dedicated UNDP web platform, and additional IFs training with UNDP and other partners is forthcoming.

—DAVID BOHL



## *Academic Affairs* **COMMITTEE**

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The Academic Affairs Committee is a volunteer group of Pardee Center staff constituted to support Goal #3 of the Center's strategic plan—namely, “To expand and improve the Pardee Center's participation in and contributions to the academic and scientific communities.” Its work focuses on a range of issues, primarily those related to academic engagement and intellectual integrity. The committee from 2020–2021 was composed of Taylor Hanna, Abigail Kabandula, Austin Matthews, and Willem Verhagen. Representing the Center's Leadership Team, Whitney Doran participated as an ex-officio member and Brian O'Neill was committee chair during his time at the Pardee Center. The chair of the Academic Affairs Committee now rotates on a quarterly basis.

Since its founding, the Academic Affairs Committee has pursued a range of large and small initiatives that sought to better codify the Center's commitment to openness and to encourage productive conversations around academic issues. One of the Academic Affairs Committee's signature

accomplishments during its initial year of work was the drafting and implementation of a document codifying the authorship norms of the Pardee Center for all published reports and articles. This authorship norms document is now being used by Pardee Center staff and faculty to facilitate open conversations about authorship ordering, inclusion, and roles, demonstrating our shared commitment to academic integrity and transparency. Since its adoption, the authorship norms document has been used to great effect, helping all contributors on projects understand their rights and obligations as participants in the publication output of the Pardee Center.

—AUSTIN MATTHEWS





## *Governance* **COMMITTEE**

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Goal #7 of the Pardee Center's Five-Year Strategic Plan is "To enhance the Center's organizational capacity and functioning vis-à-vis its human resources, its governance structure, and its financial resource base." The formal name of the staff committee leading implementation of this goal is the Human Resources, Governance, and Financial Resources Committee, but it is most often referred to simply as "the Governance Committee." Committee members this past year were Anajulia Barney, Janet Dickson, Whitney Doran, and Mickey Rafa.

Over the year the committee focused on three tasks, all of which involved broadened staff roles and widespread participation in center governance. One was to begin to formalize definitions and expectations for various Pardee Center affiliates (Core Faculty; Faculty Affiliates; Professional

Affiliates; and Pardee Scholars). A second, in conjunction with the Leadership Team, was the creation of standing committees and processes for implementation across all eight goals in the Strategic Plan.

The third task was the design, adoption, and now the implementation, of a formal professional development program for full-time center personnel. One goal of the program is to enhance the caliber of academic and professional work performed at the Center. The second goal is to help center staff pursue their professional goals regardless of whether those goals involve a long-term career at the Pardee Center or elsewhere. The program has three components: (1) individual accounts that are funded annually; (2) a pooled account to which staff may apply for additional funds; and (3) annual funds for Center-wide group activities.

—JANET DICKSON & WHITNEY DORAN

# People of Pardee:

## INCOMING *and* CONTINUING *Project Leads and Their Values*

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**OLIVIA BARROWS**  
MA INTERNATIONAL STUDIES

**PARDEE PROJECT**  
Country Organization Leader Travel Team

*The outcomes of the COLT project place connections between individuals at the forefront, reminding us of the personal nature of policy making and the relationships that construct our world. Interconnectedness is also reflected in the project's organization as research aides collaborate to produce the most complete picture possible of the complex international system.*



**BETH ANNE CARD**  
MA INTERNATIONAL DEVELOPMENT

**PARDEE PROJECT**  
Data Visualization and Analysis Team

*The fundamental nature of the questions explored and work pursued by the Pardee Center centralizes themes of interconnectedness with the global community through multi-cultural learning and understanding of global issues. Our focus on forecasting and interventions to shape alternative futures demonstrates a moral integrity of pushing for change in areas that deeply matter.*



**JEN EVANS**  
PH.D. INTERNATIONAL STUDIES

**PARDEE PROJECT**  
International Nongovernment Organizations Team

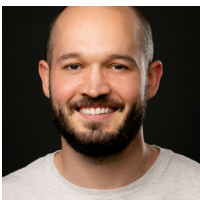
*The Pardee Center pursues its value of integrity by investing sincerely in the personal and professional development of its Research Aides and Project Leads, going above and beyond to offer opportunities for student employees to acquire valuable skills for their future careers.*



**THOMAS HADEED**  
MA GLOBAL FINANCE, TRADE,  
AND ECONOMIC INTEGRATION

**PARDEE PROJECT**  
Core Diplometrics Team

*My experience working across the Country and Organization Leader Travel (COLT), Data Visualization and Analysis, and Core Diplometrics teams at the Pardee Center highlights the importance of an interconnected approach not only to research and analysis, but also to shaping a diverse, creative, and effective research center.*



**MARK MEZIERE**  
MA INTERNATIONAL DEVELOPMENT

**PARDEE PROJECT**  
International Futures Resource Team

*Through leveraging data from several focus areas such as demography, the economy, development, and governance, the Pardee Center provides a unique window into the interconnectedness of world systems to provide analysts and policymakers with the tools to make informed decisions.*





**WONDEMNEH PAWLOSE**  
MA INTERNATIONAL DEVELOPMENT

**PARDEE PROJECT**  
Literature Review Team

*Interconnectedness and understanding are the foundations to the work I do at the Pardee Center. No one thing is explained by a certain phenomenon and looking at various lenses provides me with the flexibility of understanding topics clearly apart from my biases.*



**AUDREY PIRZADEH**  
MA INTERNATIONAL DEVELOPMENT

**PARDEE PROJECT**  
International Futures Data Team

*To me, valuing interconnectedness is essential to understanding development mechanisms. The Pardee Center has exposed me to the intricate web of interactions that take place beyond the obvious and the importance of highlighting those connections in analysis.*



**ANDRES PULIDO**  
MA GLOBAL FINANCE, TRADE,  
AND ECONOMIC INTEGRATION

**PARDEE PROJECT**  
International Futures Data Team

*As a freshman to now a second-year graduate student, I have seen Pardee triumph interconnectedness. Pardee integrates Research Aides across schools into the family, connecting us through trivia game nights, and empowering us on our teams, in trainings, and brown bags. Pardee knows the future is brighter when people are brought together.*



**LYDIA TAYLOR**  
MA INTERNATIONAL SECURITY

**PARDEE PROJECT**  
Country and Organization  
Leader Travel Team

*Pardee prioritizes interconnectedness of both its work and teams. For example, though the Country and Organization Leader Travel Team is divided into cohorts specializing in different regions of the world, all cohorts work together with the understanding that each region is an invaluable strand of the interconnected web that makes up the world system.*



**SKYLER WILKEY**  
BA INTERNATIONAL STUDIES  
AND PUBLIC POLICY

**PARDEE PROJECT**  
Country and Organization  
Leader Travel Team

*Interconnectedness, Understanding, and Integrity means to me that everyone is working together as a team toward a common goal. They are important concepts to implement in the type of work that is done at the Pardee Center because when each individual uses these values in their work it contributes to the success of the work as a whole.*

## GRADUATING *Project Leads and Their Values*



**MALLORY CANNON**  
BA INTERNATIONAL STUDIES

**PARDEE PROJECT**  
Literature Review Team

*The Pardee Center relies on a deep understanding of the interconnected relationships of international systems. Understanding the complexity of these relationships and pursuing this knowledge with integrity and intellectual curiosity is paramount to the International Futures model and the Pardee Center as a whole.*



**MARIANNE HUGHES**  
MA INTERNATIONAL STUDIES

**PARDEE PROJECT**  
Country and Organization  
Leader Travel Team

*The granularity of analysis available through the work of the Pardee Center, specifically the Diplometrics Program, gets to the very heart of what it means to understand the world around us. It is through the hard work of more than fifty researchers that we continue to make our datasets the most qualitatively rich and quantitatively robust they can be.*



**KATHERINE LABOMBARDE**  
MA INTERNATIONAL DEVELOPMENT

**PARDEE PROJECT**  
Core Diplometrics Team

*Interconnectedness is central to the Pardee Center's work, especially as it drives the utility of the International Futures system. This is also reflected among our personnel, from regular sharing of news and learning to supporting coverage across teams whenever needed.*

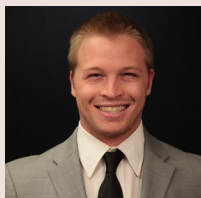


**AILI MAKELA**  
BA INTERNATIONAL STUDIES

**PARDEE PROJECT**  
Diplomatic Services Team

*To me, interconnectedness means working as a team. Without good communication and teamwork, we can't complete the work we've been entrusted with to the best of our ability. Having a team that is close-knit and isn't afraid to communicate their problems means more individual and team success in the end.*

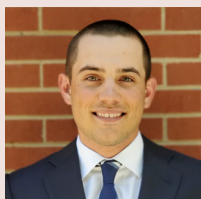
”  
**Striking that balance and continuously working on a shared understanding of our research means integrity is at the heart of what we do as a center.**



**JEFFREY MILLMAN**  
 MA INTERNATIONAL STUDIES

**PARDEE PROJECT**  
 Country and Organization  
 Leader Travel Team

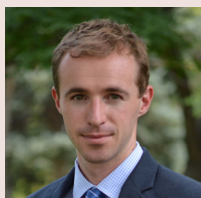
*The Pardee Center embodies interconnectedness not only through the fostering of a diverse and vibrant community within the Center, but also through engagement with a wide range of global actors and institutions with the aim of helping to solve the most pressing problems in development and public policy.*



**KEVIN O'CONNELL**  
 MA INTERNATIONAL SECURITY

**PARDEE PROJECT**  
 Country and Organization  
 Leader Travel Team

*Interconnectedness, integrity, and understanding form the foundation of communication between individuals and groups. We must focus on these values to tackle the pressing issues of our time.*



**ANDREW WOODWARD**  
 MA GLOBAL FINANCE, TRADE,  
 AND ECONOMIC INTEGRATION

**PARDEE PROJECT**  
 International Futures Data Team

*Integrity has been a key aspect to the success of our team—both in our professional relationships as researchers and our individual work as data analysts. Through their honesty and diligence, the International Futures Data Team has shown a strong commitment to each other and to the global impact of the work we produce.*



**VIVIAN YANG**  
 MA GLOBAL FINANCE, TRADE,  
 AND ECONOMIC INTEGRATION

**PARDEE PROJECT**  
 International Futures Data Team

*The Pardee Center helps create a framework of how the world works and how we can aspire to improve it. Each of the Pardee Center's teams work to build a better understanding of the interconnected dynamics in global development to contribute to important and impactful analysis.*

## CELEBRATING *the Pardee Center's* RESEARCH AIDES

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### HAROLD W. ROSENTHAL FELLOWSHIP

The Harold W. Rosenthal Fellowship is a highly selective program for master's students that funds summer work opportunities in congressional or executive branch offices. We would like to congratulate Pardee Center Research Aide **Andres Pulido**, who was chosen as a recipient of the Harold W. Rosenthal Fellowship.



**ANDRES PULIDO**, was chosen as one of four *Colorado Truman Scholarship* finalists in Spring 2021, based on his deep commitment to public service. Now, in Summer 2021, he gained further experience as a Rosenthal Fellow assigned to the Chief Economist of the Office of the U.S. Trade Representative in the Executive Office of the President.

### BOREN FELLOWSHIP

The Boren Fellowship is a highly selective critical language study program funded by the National Security Education Program. After completion of the fellowship, recipients serve in the federal government for at least one year. We would like to congratulate the following Pardee Center Research Aides and Boren Fellowship recipients.

**HENRY HEILBRONER** will be going to the Pontifical Catholic University of Rio de Janeiro, Brazil, to study Portuguese.

**CAITLIN NAVRATIL** will be going to Chulalongkorn University in Bangkok, Thailand, to study Thai.

**ROZALIA SCHLEINIG** will be going to Taiwan to study Mandarin Chinese.

## UNDP INTERNSHIP HIGHLIGHT

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### CAIO COTTA PEREIRA

Through my internship with the United Nations Development Programme (UNDP), I was able to learn in-depth the most important dimensions that surround the implementation and accomplishment of the Sustainable Development Goals (SDGs). My tasks involved assisting with the preparation of policy documents and reports as well as conducting individualized quantitative analyses for a wide range of country offices. This experience not only exposed me to the workings and structure of the whole United Nations system, but it also connected me with some of the most prominent individuals in the realm of international development.

—CAIO COTTA PEREIRA



### VIVIAN YANG

Vivian interned as a Research Analyst with UNDP's SDG Integration Team of the Bureau for Policy and Programme Support in the summer of 2020. During her time as an intern, Vivian provided data and conceptualization support as the UNDP developed its COVID-19 Data Futures Platform. She helped with qualitative and quantitative analysis to assess how countries were coping and adapting to COVID-19. Additionally, she supported training sessions for the International Futures model to assist UNDP staff members in quantitative evidence-based policy development.

—RHEA GROVER

## *Alumni* SPOTLIGHT:

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### MARK ESHBAUGH

Korbel School alumnus (2012) and former Pardee Center Research Aide Mark Eshbaugh is currently employed in the State Department's Office of Economic Analysis with the lead role on the team covering energy and economic security issues. The position represents a long-held career ambition of Mark's and he credits his studies at the Korbel School and his work with the Pardee Center as the foundation for the career trajectory that brought him to this position.

Prior to his current role, as a recently graduated Master's student in the Korbel School's Global Finance, Trade, and Economic Integration program focused on energy and foreign policy, Mark accepted a position with the Department of Energy's (DOE) Energy Information Administration on the international team tasked with energy data collection, analysis, and dissemination, and short- and long-term modeling. This experience drew upon data and modeling skills and the futures-oriented thinking he

developed as a student in Barry Hughes' International Futures (IFs) course and as a Research Aide at the Pardee Center from 2010 to 2012.

Mark began his work at the Center with Barry Hughes and Research Consultant Mohammad Irfan as part of the IFs Data Team. While this experience was foundational to his understanding of the IFs model and forecasting analysis more broadly, he attributes experience facilitating IFs trainings among clients and partners during his second year for extending his knowledge and expertise around the kind of analysis completed by the Pardee Center. Though Mark acknowledges that his first time providing an IFs training was perhaps not quite as effective as his last, he notes that many of the skills he honed during this period contributed to his work with the DOE. He notes further that they continue to enhance his current State Department work and have proved invaluable during his two years at the White House as the Director for

Energy at the National Security Council and National Economic Council.

When asked what advice he might share with current Research Aides at the Pardee Center, Mark related advice given to him as a recent Master's graduate by the Korbel School's former Dean, Christopher Hill—namely, that if you are seeking a long-term career with the U.S. Government, but are unsure of where your particular career path may begin, pursue any opportunities you may have to get your foot in the door while gaining meaningful experience from within a federal agency. Mark notes that the opportunity to take part in substantive research at the Pardee Center positioned him well for the fulfilling career trajectory on which he currently finds himself and that he hopes to continue contributing to energy-related foreign policy throughout the remainder of his career..

—WHITNEY DORAN



## *New Staff* **SPOTLIGHT:**

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### **CORY VANDENBURG**

Cory Vandenburg joined the Pardee Center as a Research Aide in 2019 and member of the Military Inventory Project under the Diplometrics Program. The following year, he transitioned to the Pardee Center's Statistics and Data Visualization Team, where he worked until September of 2020. Cory currently works as a Systems Developer for the Pardee Center in a full-time staff position. He is also pursuing a Master's degree in International Security with the Korbel School.

Prior to joining the Pardee Center, Cory graduated with two bachelor's degrees, a B.A. in International Studies and Computer Science, and a B.S.B.A. in Business Information and Analytics. As part of his undergraduate work with Professor Keith Gehring, he wrote an honor's thesis titled "Information and Communication Technologies Diffusion's Potential Impact on Regime Change in States Experiencing Intra-State Conflict."

At the Pardee Center, Cory's role involves working with optimization, bug removal, and feature implementation for the International Futures system. Cory also manages the Data Visualization and Analysis Team that handles all the planning, implementation, and final review for data visualization and mining projects across the Center. He hopes to focus his future academic work on quantitative research methods, the potential impacts of information communication technology on state stability, and the use of internet search data for foreign policy analysis. He is also interested in pursuing a Ph.D. in International Studies after completion of his Master's studies in 2023. When not working at the Pardee Center, Cory develops video games, does long-distance running, skis, and cooks. One can also find him volunteering as a public speaking coach for the University of Denver's Mock Trial Team.

—RHEA GROVER



## Current Staff SPOTLIGHT:

### ANAJULIA BARNEY

#### **Q | What has been your favorite project while working at the Pardee Center?**

I really enjoyed working with the Pardee Center's Human Resources, Governance, and Financial Affairs Committee on creating the Professional Development Program. I am excited for the opportunities that the program will make available to our staff and contract personnel. I feel happy that I was able to contribute to the creation of the program and look forward to playing a role in its implementation.

#### **Q | What have you learned while working at the Pardee Center and what might you like to learn more about in the future?**

I have learned and continue to learn so much since I started working with the Pardee Center over two years ago. One of the many things I learned in the last year was how to create a project budget and to manage it through completion. As I continue to learn and do this more, I am interested in learning and becoming more involved in the creation of the Pardee Center's annual budget to have a better understanding of the Center's different components and operations.

#### **Q | What do you enjoy about working with Research Aides at the Center?**

Our Research Aides are amazing and do so much for the Center! I find it very motivating and humbling to learn about the different backgrounds and accomplishments that have enabled our Research Aides to be at DU, the different skills and things that they do inside and outside of the Pardee Center, and their plans for the future.

#### **Q | What do you enjoy doing outside of the Pardee Center and your work?**

Just like many people living in Colorado, I enjoy outdoor activities. I especially like hiking, road biking, and skiing. I also like to cook, bake, and especially eat! I always look forward to trying out new food and discovering good restaurants. Lastly, I like to read in my spare time. Last year during quarantine I started reading the Harry Potter books for the first time and just finished the last book in June. It was a super fun journey!

#### **Q | What is your favorite part about living in Denver?**

My favorite part about living in Denver is the weather. I grew up in the Chihuahuan Desert, which is extremely dry and hot in the summer and extremely dry and cold in the winter. I really enjoy having four seasons and the different activities that come with them, like white water rafting in the spring, camping and road biking in the summer, and skiing in the winter.

—RHEA GROVER



# Pardee in the World

## PRESENTATIONS, CONFERENCES, MEETINGS, & EVENTS

### OCTOBER 2020

- ◆ Willem Verhagen presented to a United Nations Development Programme (UNDP) panel along with Ahunna Eziakonwa, head of UNDP-RBA Africa on a joint UNDP-Pardee Center study that discussed the policy implications of COVID-19 on socioeconomic development throughout sub-Saharan Africa.

### DECEMBER 2020

- ◆ Collin Meisel led a presentation to the USAID Ukraine Mission Director and staff on the Pardee Center's Indicators and Warnings report, which was followed by a Q&A session.

### JANUARY 2021

- ◆ Jonathan Moyer presented at the NEPAD@20 Symposium “Advancing Africa’s Development: Reflections on Achievements, Successes, and Challenges,” which included contributions from various current and former heads of state and leaders of regional and continental organizations, on research collaborations between the Pardee Center and the African Union Development Agency.

### FEBRUARY 2021

- ◆ United Nations Development Programme (UNDP) Administrator Achim Steiner highlighted the Pardee Center’s joint research with UNDP on COVID-19’s economic effects at the High-Level Political Segment of the 46th United Nations Human Rights Council.
- ◆ Willem Verhagen participated in a second United Nations Development Programme (UNDP) panel discussion, organized by Chatham House, on the joint UNDP-Pardee Center study discussing policy implications of COVID-19 on socioeconomic development throughout sub-Saharan Africa.
- ◆ Collin Meisel participated in a virtual panel discussion hosted by the U.S. Army Training and Doctrine Command's Mad Scientist Initiative on Competition and Conflict in the Next Decade.

## MARCH 2021

- ◆ The Pardee Center released its joint report with the United Nations Development Programme, the Institute for Security Studies, and the Gordon Institute for Business Science on COVID-19's long-term socioeconomic impacts on Africa.
- ◆ Collin Meisel presented to the USAID Ukraine Mission Director and staff on the Center's recent Scenario Surveillance Analysis Report.

## MAY 2021

- ◆ David Bohl, Taylor Hanna, Jonathan Moyer, and others at the Pardee Center completed a series of ten virtual trainings with hundreds of individuals representing United Nations Development Programme country offices from around the world.
- ◆ Austin Matthews, Research Scientist, participated in the Responsible Public Engagement Institute hosted by the Sié Chéou-Kang Center at the University of Denver. This workshop helped participants to better think about the ethical considerations and importance of public engagement with the policy world.

## JUNE 2021

- ◆ Jonathan Moyer, Abigail Kabandula, and Collin Meisel participated in a panel discussion hosted by the Pardee Center and the Atlantic Council to discuss their joint report on China-U.S. competition in Southeast Asia using the Formal Bilateral Influence Capacity Index.
- ◆ Axios featured research by the Pardee Center and the Atlantic Council in a piece titled, "Mapping China's Growing Global Influence." The article builds upon the Pardee Center and Atlantic Council joint report titled "China-US Competition: Measuring Global Influence."
- ◆ The Pardee Center and Atlantic Council's joint research titled "China-U.S. Competition: Measuring Global Influence" was featured on Politico Playbook.
- ◆ The Atlantic Council article titled "In Brief: Fifteen Takeaways from Our New Report Measuring U.S. and Chinese Global Influence" featured work done by the Pardee Center and the Atlantic Council.

## AUGUST 2021

- ◆ Jonathan Moyer and Collin Meisel were featured along with Matthew Burrows of the Atlantic Council in the Strategic Multilayer Assessment (SMA) Speaker Session hosted by National Security Innovations to present on the Pardee Center and Atlantic Council joint research paper titled "China-US Competition: Measuring Global Influence."

# Publications

## 2020–2021

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### JOURNAL ARTICLES

#### Are Scenario Projections Overly Optimistic About Future Yield Progress?

By: Willem-Jan van Zeist, Elke Stehfest, Jonathan C. Doelman, Hugo Valin, and Katherine Calvin et al.  
(including Willem Verhagen)

GLOBAL ENVIRONMENTAL CHANGE, SEPTEMBER 2020

*This paper assesses projections of crop yields by global agricultural land-use and integrated assessment models. It also discusses possibilities of better aligning agronomic understanding of yield gaps and yield potentials with modeling approaches.*

#### Estimating Current Values of Sustainable Development Goal Indicators Using an Integrated Assessment Modeling Platform: “Nowcasting” with International Futures

By: Barry B. Hughes, Mohammad T. Irfan, José R. Solórzano, Vivian Yang, and Jonathan D. Moyer

IOS PRESS JOURNAL, JANUARY 2021

*This article uses the International Futures Pre-Processor to “Nowcast” several sustainable development goal indicators. It documents the methodology of that nowcasting and provides examples of recent and current year estimated values for variables across the SDGs.*

#### Enhancing Integrated Analysis of National and Global Goal Pursuit by Endogenizing Economic Productivity

By: Barry B. Hughes and Kanishka Narayan

PLOS ONE, FEBRUARY 2021

*This article describes a modeling approach that considerably further extends the endogenization of productivity, imbedding the resultant structure in the economic model of the International Futures integrated assessment system.*

#### The Nomination and Electoral Competitiveness of Working Class Candidates in Germany

By: Austin S. Matthews and Yann P. Kerevel

GERMAN POLITICS, FEBRUARY 2021

*Austin Matthews and Yann Kerevel (Associate Professor, Louisiana State University) published an article in German Politics. Their work examined how class identifiers affect candidate selection by German political parties and how this identity leads to bias by voters.*

#### Balancing Conservation Priorities for Nature and for People in Europe

By: Louise M. J. O'Connor, Laura J. Pollock, Julien Renaud, Willem Verhagen, Peter H. Verburg, Sandra Lavorel, Luigi Maiorano, and Wilfried Thuiller.

SCIENCE, MAY 2021

*This article explores potential priority areas in Europe for enhancing biodiversity and a set of cultural and regulating Nature's Contributions to People (NCP) while considering demand for these NCP.*

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### REPORTS

#### Sudan at the Crossroads: Strategic Policy Choices, COVID-19, and Socioeconomic Development to 2040

By: Abigail Kabandula, Willem Verhagen, David K. Bohl, Taylor Hanna, and Jonathan D. Moyer

UNDP SUDAN, OCTOBER 2020

*This report quantitatively models four scenarios that represent alternative development pathways for Sudan that focus on two dimensions of uncertainty: the effect of COVID-19 on the economy and health, and alternative development policy choices.*

### **COVID-19: The Future of African Development Systems**

By: Jonathan D. Moyer, Abigail Kabandula, David K. Bohl, Vivian Yang, Kaylin McNeil, Yutang Xiong, Dr. Ibrahim Mayaki, Martin Bwalya, George Murumba, and Bernice Mclean

AUDA-NEPAD, NOVEMBER 2020

*This report introduces a framework to aid decision makers in thinking about the long-term effects of COVID-19 on development and the pursuit of Agenda 2063 through various types of interrelated research.*

### **Impact of COVID-19 on the Sustainable Development Goals: Pursuing the SDGs in a World Reshaped by COVID-19**

By: Barry B. Hughes, David K. Bohl, Taylor Hanna, Kaylin McNeil, Jonathan D. Moyer, Laurel Patterson, Babatunde Abidoye, Serge Kapto, Joanna Felix, Lars Jensen, Maria Marta Rey Mdh, Youngeun Kang, and Tasneem Mirza.

UNDP, DECEMBER 2020

*This joint Pardee Center-UNDP study maps out three different futures to assess potential COVID-19 recovery trajectories. In the most damaging scenario, it finds that the pandemic could lead to over 1 billion people living in extreme poverty in 2030.*

### **Analysing Long-Term Socio-Economic Impacts of COVID-19 across Diverse African Contexts**

By: Willem Verhagen, David K. Bohl, Jakkie Cilliers, Barry B. Hughes, Stellah Kwasi, Kaylin McNeil, Marius Oosthuizen, Luca Picci, Mari-Lise du Preez, Yutang Xiong, and Jonathan D. Moyer.

UNDP REGIONAL BUREAU FOR AFRICA, MARCH 2021

*This report examined the effect COVID-19 will have on macro-economic development in 10 African countries by 2030 and 2050. It presents the multifaceted economic and social consequences of the COVID-19 pandemic across Africa, including on human development indicators, economic interdependence, and growth and resilience patterns.*

### **China-US Competition: Measuring Global Influence**

By: Jonathan D. Moyer, Collin J. Meisel, Austin S. Matthews, David K. Bohl, and Mathew J. Burrows.

ATLANTIC COUNCIL, MAY 2021

*This report analyzes the global implications of US-China competition with a particular focus on trends and relationships in Southeast Asia by introducing the Formal Bilateral Influence Capacity Index, a quantitative measure of multidimensional influence between pairs of states from 1960 through 2020.*

### **Assessing the Impact of Conflict on Development in North-East Nigeria**

By: Taylor Hanna, David K. Bohl, Mickey Rafa, and Jonathan D. Moyer.

UNDP, JUNE 2021

*The report uses the IFs model to compare two scenarios for evaluating conflict's direct and indirect effects in North-East Nigeria: a Conflict scenario that simulates conflict and its effects based on the best data and literature available, and a No Conflict scenario that simulates development in a counterfactual scenario without conflict.*

### **The Future of Zambian Poverty to 2060: Assessing National and Sub-National Trends Across Scenarios**

By: Mickey Rafa, Singumbe Muyeba, Jonathan D. Moyer, and Taylor Hanna

CHRONIC POVERTY ADVISORY NETWORK, JUNE 2021

*This report utilizes the Zambian government's 2015 Living Conditions Monitoring Survey to understand the current state of poverty in Zambia. It then explores the potential long-term future of national and provincial-level poverty in Zambia using the International Futures forecasting system.*

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## NEWSPAPERS AND BLOG POSTS

### How Do You Actually Measure Military Capability?

By: Collin J. Meisel, Jonathan D. Moyer, and Sarah Gutberlet

MODERN WAR INSTITUTE, SEPTEMBER 2020.

*Authors introduce the Pardee Center's Military Equipment Index.*

### COVID-19 May Increase Trade between Africa and China to the Detriment of the EU and US

By: William Verhagen, David K. Bohl, Jonathan D. Moyer, and Stellah Kwasi

THE DAILY MAVERICK, MARCH 2021

*This piece focuses on global trade and discusses how COVID-19 will likely accelerate trade shifts away from Europe, the U.S., and India.*

### Let's Get Real About US Military 'Dominance'

By: Collin Meisel

DEFENSE ONE, APRIL 2021

*Collin Meisel writes that American strategists must resist the assumption that the U.S. military will be the superior force in any given situation.*

### Seeking Serenity: A New American Influence Strategy for Southeast Asia and Beyond

By: Austin S. Matthews and Collin J. Meisel

WAR ON THE ROCKS, MAY 2021

*This piece suggests a less confrontational approach toward American influence abroad, focusing on bilateral relationships where the United States enjoys structural advantages relative to China, and supports a new vision of regional intradependence.*

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## THIRD PARTY PUBLICATIONS

### From Insights to Action: Gender Equality in the Wake of COVID-19

By: Ginette Azcona, Antra Bhatt, Jessamyn Encarnacion, Juncal Plazaola-Castaño, Papa Seck, Silke Staab, and Laura Turque  
UN WOMEN, SEPTEMBER 2020

*This publication presents new estimates on extreme poverty by sex and age which are the outcome of the UN Women-UNDP collaboration with the Pardee Center.*

### Human Well-Being and Capabilities

By: Sophie Plagerson, Patricio Cuevas-Parra, Paola Ballon, and Thomas Biersteker

UNDP, MARCH 2021

*The work of the Pardee Center was cited in the UN Research Institute for Social Development's "Human Well-Being and Capabilities" Report.*

### Sustainable and Just Economies

By: Joachim Monkelbaan, Denison Jayasooria, Marianna Leite, and Raymond Saner

UNDP, MARCH 2021

*The Pardee Center was cited in the UN Research Institute for Social Development's "Sustainable and Just Economies" Report.*

### Food Systems and Nutrition Patterns

By: Neetu Choudhary, Kiah Smith, Mary Ng'endo Kanui, and Ahmad Mukhtar

UNDP, MARCH 2021

*The Pardee Center was cited in the UN Research Institute for Social Development's "Food Systems and Nutrition Patterns" Report.*

### China's Trade with Latin America Is Bound to Keep Growing. Here's Why That Matters.

By: Pepe Zhang and Tatiana Lacerda Prazeres

WORLD ECONOMIC FORUM, JUNE 2021

*David Bohl contributed to the article published by the World Economic Forum.*

*“Join us as we search  
for new ways to better  
understand the world  
around us in support  
of helping all humans  
live safely and fully in  
a world of complexity  
and uncertainty.”*





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