**FREDERICK S. PARDEE CENTER
FOR INTERNATIONAL FUTURES**
JOSEF KORBEL SCHOOL OF INTERNATIONAL STUDIES
UNIVERSITY of DENVER

ANNUAL REVIEW
2019–2020

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Dear Friends,

Over the past year, the Pardee Center engaged in a participatory strategic planning process to develop a five-year plan, along with new vision, mission, and value statements. Our plan was adopted following endorsement by Korbel School and University leadership this spring. We provide an overview of the plan and list its eight strategic goals later in this Annual Review.

The plan reaffirms the core thrust of the Center's research approach—namely, to understand, represent, and share knowledge about the interacting human, social, and biophysical system drivers of global change and trends. We have now embarked on an ambitious Implementation Plan to achieve the eight goals identified in this collaborative process!

> We have embarked on an ambitious Implementation Plan to achieve the goals identified in our five-year plan.

Also during the past year, significant challenges to our efforts to conceptualize and model drivers of global change came in the form of the COVID-19 global pandemic. We moved quickly to explore and develop ways to represent various long-term effects of COVID-19 on patterns of development. In recent months we have produced analyses of its effects on long-term outcomes for issues such as the distribution of global poverty, the achievement of the Sustainable Development Goals, the probability of internal war and state fragility, and the global distribution of power in the international system.

Our analyses were supported by extending and enhancing the International Futures (IFs) tool to better represent the global shock of COVID-19 through changing patterns of mortality, economic growth, and international interdependence. Through these extensions in our flagship research tool we have increased our collaborations with
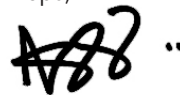
the international development community. Recently, we signed a Memorandum of Understanding with the African Union Development Agency and published a report on the effects of COVID-19 on development across the African continent. Currently, we are delivering a series of multi-week virtual training sessions on the use of IFs to United Nations Development Programme staff to help them better understand possibilities for post-pandemic development outcomes in their countries.

Even as we felt the need to enlarge the scope of our research to reflect some of the important challenges introduced by the global pandemic, we also remain committed to ongoing projects and partners. The Center continued to be heavily involved in the Intergovernmental Panel on Climate Change, we continue to build and evaluate datasets related to international relations through the Diplometrics Program, and we continue our focus on developing and deploying resources for training and capacity building in support of development.

The broadly disruptive events of 2020 have reinforced the importance of using quantitative tools to better understand both ongoing and novel aspects of our changing world. Such tools help us focus our questions, winnow possible intervention points, and better support policy-making processes that broadly and sustainably improve the human condition.

Both personally and professionally, we have experienced dramatic changes in how we organize, communicate, and care for one another over the past several months. As a Center, we have become more resilient and we have a greater sense of community, deeper institutional partnerships, and a renewed vision for our work now and into the future.

In hope,

JONATHAN D. MOYER,
DIRECTOR

Ten Years in Review: PPHP Volumes I and II

A decade has passed since the release of the first two volumes in the Center's Patterns of Potential Human Progress (PPHP) series. Those volumes, published jointly by Paradigm and Oxford University Press India, were *Reducing Global Poverty* (2009) and *Advancing Global Education* (2010). The volumes broke new ground in research in the two issue areas by looking out across 50 years in over 180 countries and by incorporating treatment of their respective subject matter within an extensively integrated model system.

Prior to the work undertaken for the volumes, the International Futures (IFs) system did not contain separate representation of either poverty or education, but it did include strong models of demographics and economics as a foundation for them. Generous support from Frederick S. Pardee made it possible to develop extensive models not only for poverty and education, but also for health, infrastructure, and governance (the subjects of the three later volumes in the PPHP series) within the IFs system.

Reducing poverty and advancing education remain central to global goals for improving the wellbeing of individuals and societies. Where are we now, 10 years after the publication of these first two volumes in the PPHP series?

—BARRY HUGHES & MOHAMMOD IRFAN

Poverty Update

During the period of our poverty volume research and writing, the Millennium Development Goals called for reducing poverty rates by half between 1990 and 2015. The goal was achieved on a global level but not, as our forecasts anticipated, in most developing countries. Since the publication of the volume, the current Sustainable Development Goals (SDGs) have again identified poverty reduction as a primary goal. In fact, the SDGs call for the eradication of poverty by 2030. That is generally understood as bringing the level in all countries globally below 3 percent of population, a level that unfortunately will also not be reached but remains a critical target. The two interacting and most immediate or proximate determinants of poverty rates are the average income (or consumption) of societies and income distribution. IFs looks to its projections of

> Modeling of the driving variables of poverty in IFs continues to improve, with considerable recent attention given to income distribution and its ties to changing labor market dynamics.

those variables in alternative scenarios for its calculation of the percentage rate and absolute number of those living below any designated poverty-level threshold. It assumes log-normal distribution of income and consumption within populations.

While attention to those proximate drivers is quite standard in poverty forecasting, the value added by IFs includes (1) also representing many distal drivers of income, consumption, and their distribution; (2) modeling of forward impacts of poverty to a number of variables, including undernutrition; and (3) imbedding this expanded treatment of poverty within an extensive model system that includes interacting representations of many other variables across the 17 SDGs.

Initial year poverty data are regularly updated in IFs and poverty metrics in IFs change over time. At the time of the PPHP volume, for example, the threshold for extreme poverty in IFs was $1.25 per day in 2005 dollars whereas

it is now $1.90 in 2011 dollars. IFs also calculates the globally misnamed "moderate" poverty level of $3.10 per day, and a specialized poverty display form allows calculation at any level.

Of particular importance, a specialized form now shows poverty in the context of national, regional, and global progress on indicators across the SDGs. In addition, we have added representation of poverty by age and sex in support of Unite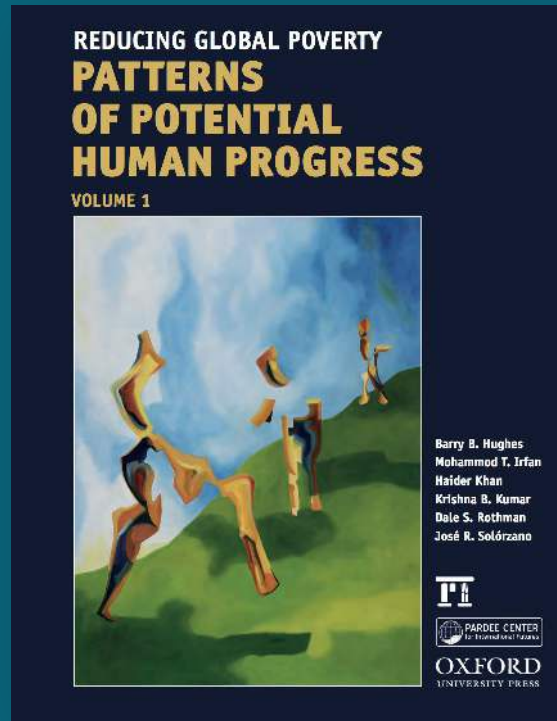d Nations efforts to assess women's progress. Further, modeling of the driving variables of poverty in IFs continues to improve, with considerable recent attention given to income distribution and its ties to changing labor market dynamics.

Looking forward, we will continue to regularly evaluate and incorporate new data and represent changing metrics in our standard calculations. In terms of modeling enhancements, a likely new project will augment treatment of income distribution by representing income across population deciles, important because income distribution shapes vary substantially across countries and time. Other enhancements will center on the development of alternate scenarios of future poverty, including analysis of the impact of the COVID-19 pandemic.

REDUCING GLOBAL POVERTY
PATTERNS OF POTENTIAL HUMAN PROGRESS
VOLUME 1

Barry B. Hughes
Mohammod T. Irfan
Haider Khan
Krishna B. Kumar
Dale S. Rothman
José R. Solórzano

PARDEE CENTER
for International Futures

OXFORD
UNIVERSITY PRESS

Education Update

The PPHP education volume chronicled the unprecedented global increase in education participation rates occurring at that time and forecast their future trajectory and eventual attainment levels for each of over 180 countries. A key marker was the Millennium Development Goal (MDG) of universal primary education (UPE) by 2015, a target that (as with the MDG poverty goal) was not met, but toward which great progress was made.

> The IFs education model represents student flows through formal education systems and tracks resultant educational attainment of adults by age and sex.

Inspired by the impressive progress toward attaining UPE by 2015, the global community then set a further goal for education participation as one of the Sustainable Development Goals—namely, universal secondary education by 2030. Going beyond the quantitative expansion of student enrollment through the secondary level, the education SDG also declares a commitment to the quality of education and to the promotion of lifelong learning.

The IFs education model represents student flows through formal education systems and tracks resultant educational attainment of adults by age and sex. The unique strengths of our approach include the following:

- Inputs from the economic and government finance models interact with demographics to drive education enrollment rates through calculation of costs associated with varying education scenarios and the availability of funding.

- In turn, education attainment levels become drivers of other variables, such as GDP per capita and fertility rates.

The connections between the education, demographic, health, economic, and government finance models make it possible to explore the costs, benefits, and trade-offs associated with various education and other policy approaches and arenas across time, especially important since education has very expensive front-end costs and delayed—although eventually very significant—positive development impacts.
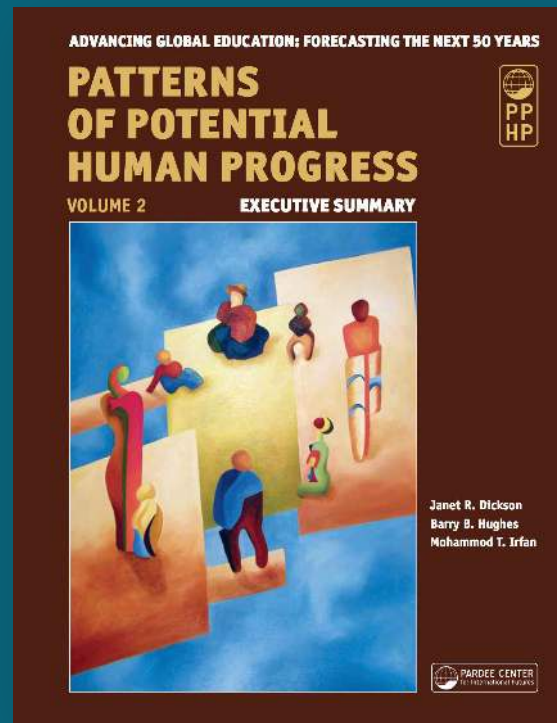
The strengths of the integrated IFs system enabled a project with the International Commission on Financing Global Education Opportunity in 2016. That work explored the impacts, costs, and financing of universal secondary education by 2030 and included development of an alternate "aggressive but reasonable" scenario.

In other recent work, using data standardized by World Bank researchers, we added internationally-comparable learning quality scores to the education variables forecast by IFs. As a consequence, a 2019 USAID regional report on education in Central America and the Caribbean included drivers and outcomes of education quality from IFs, while that same year USAID reports specific to Honduras and Guatemala used analyses by the Pardee Center to examine the impact of education quality and quantity on development.

Currently our work is focused on comparing projections of adult attainment from IFs with those from the International Institute for Applied Systems Analysis (IIASA). Foundational elements involve enhancements of data initialization for student flows in IFs and comparing the initializations of adult attainment structures from the two projects.

PARDEE BY THE NUMBERS

17

SPONSORED
PROJECTS
WITH 11 CLIENTS

3

NEW FULL-TIME
TEAM MEMBERS

17

FULL-TIME
TEAM MEMBERS

84

STUDENTS EMPLOYED
FROM 5 UNIVERSITY OF DENVER
COLLEGES AND SCHOOLS

4

COURSES
TAUGHT BY
PARDEE CENTER
FACULTY

**OVER
$1.8
MILLION**

IN SPONSORED
RESEARCH

Update on the International Futures System

Three characteristics of the International Futures (IFs) tool organize most ongoing model development efforts and did so again this year: (1) the extensive coverage within component models; (2) the importance of connections among those models; (3) the emphasis we place on making the system freely available and facilitating its ease of use.

Because the economic model is both affected by and also affects so many other models in the system, it received considerable attention over the last year. Enhancements to its productivity side include endogenizing the basic pace of conditional convergence to global technological leadership and improving the representation of variations in that pace resulting from factors such as population disability rates and trade openness.

For the economy's labor market, we drew on newer and stronger data and added representation of labor participation by age. The structure of the labor market's interaction with income distribution was strengthened by recognizing differential demands for unskilled and skilled labor by sector. Government finance also interacts strongly with the economy, and we enhanced its equilibrium-seeking revenue and expenditure dynamics.

In the health model, we added COVID-19 mortality to that from other infectious diseases, enabling scenario analysis around the pandemic (also with alternative economic growth scenarios). For HIV/AIDS and malaria, we introduced differentiated representation of incidence, prevalence, and mortality. We also improved the maternal mortality formulation. In the population model we moved from net representation of national migration and remittances to two-way formulations.

On the biophysical side of the IFs system, we improved formulations controlling changes in land use and in agricultural price responsiveness to food stocks. In energy, we changed our representation of trade, generally lowering forecasts of energy trade. We updated initialization data on annual carbon emissions and the parameters linking them to atmospheric concentrations.

Many of these and other model enhancements were stimulated by Pardee Center projects described elsewhere in this annual review. Country-specific projects, including work related to Zambia, encouraged some of the improvements in labor and agriculture and led to enrichment of representation of sociopolitical entities (like states and provinces) within countries. Work related to Yemen encouraged attention to the economy, poverty, and state failure. In combination with the Global Trends project, the Yemen project also encouraged added flexibility in selecting the model base year and improving historical analysis with IFs.

By far, the largest modeling project over the past year involved translation of IFs code from Visual Basic 6 to .NET. That translation is complete, and the translated version is currently being validated to be sure results are consistent with the earlier version. Work is also near completion on our existing web interface to allow it to access the translated version and its results. In addition, we have completed the creation of an installation package that allows automatic configuration of everything needed for the .NET version to work in non-development environments. Together these changes will make it much easier for model developers around the world to access and understand IFs and to start to incorporate their own changes into the model.

—BARRY HUGHES & JOSÉ SOLÓRZANO
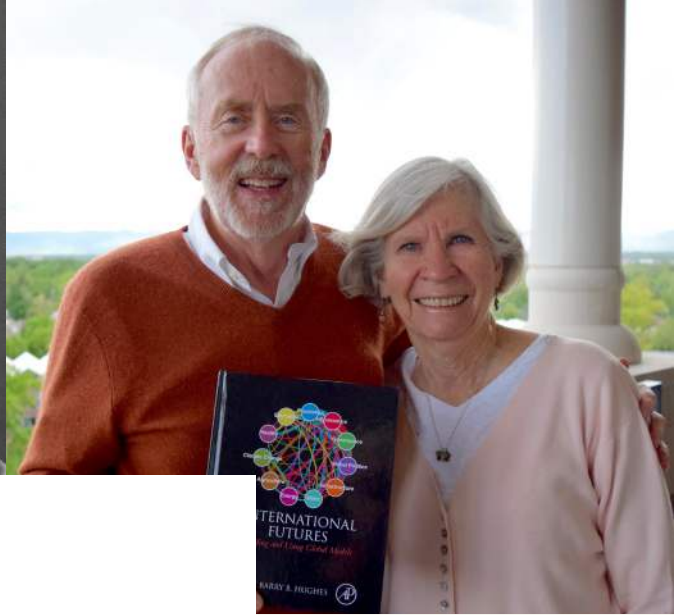
Pardee Center Strategic Plan for 2020–2025

The Pardee Center engaged in a year-long collaborative planning process between March 2019 and March 2020 to set strategic directions for the Center for the five-year period from 2020–2025. Occasioned in part by rapid growth in projects and staff in recent years, it involved a comprehensive look at why we exist (our vision), what we do (our mission), and how we do it (our values).

The process affirmed the continued centrality of core components of the Center's current research focus and approach for the coming 5-year period—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 (IFs) system of models for that work—supplemented as appropriate with other analytic tools—over the 5-year planning horizon.

At the same time, the planning process identified goals and initiatives to facilitate a more strategic shaping of the Center's research portfolio and, importantly, to expand and improve the Center's participation in, and contributions to, academic and scientific communities. We aspire to play a lead role as a maturing organization whose work combines and is strengthened by both scientific and applied policy-relevant work related to sustainable development.

Our home in the University of Denver's Josef Korbel School of International Studies provides the foundation for our work which, in turn, aligns with many of the core themes of the School, such as security, inclusive economic growth, democracy, sustainability, and human rights. Around these themes, we share a commitment to producing research with impact, to engaging students in a broad range of learning opportunities, and to interacting with policy communities and other constituents in the public arena. A number of the strategic goals and subgoals in our plan reflect the connections we already share with the broader Korbel community. Others are directed at strengthening and expanding them. We look forward, for example, to developing a close connection with the School's recently established Scrivner Institute for Public Policy.

The particular strength of the Pardee Center will continue to be in its integrated approach to understanding both (a) the interacting inputs to human, social, and natural system change; and (b) the consequences of change in any one of those arenas across all three. Our tools and our orientation encompass more variables in interaction than any other integrated assessment modeling system, allowing us to address a broad range of future-oriented questions across these domains.

In addition to these research foci on changes in human and sociopolitical systems, including their interactions with natural systems, is our ongoing focus on research methodology. We will continue to work to improve the scientific foundation of our tools, including not only the IFs system but also through gathering data, building datasets, and the use of innovative data analysis and presentation tools. Building from these efforts, we strive to continuously improve the quality of the policy-related analyses and projections that characterize our work. And finally, we try to be ever mindful of broad epistemological questions related to the utility of models and modeling enterprises in our quest to contribute to building knowledge for future wellbeing.

Equally important as the focus on the substantive components of our work, the planning process involved an assessment of the Center's governance, structure, and culture. We placed emphasis on making changes appropriate to our growth in size and the increased diversity of interests and capabilities of our personnel.

The resulting plan has eight goals that form a comprehensive and coherent plan for the Center to be a model DU research center conducting cutting-edge social science research that is collaborative, inclusive, and financially sustainable.

The eight goals for the 2020-2025 period appear below. Each goal includes multiple actionable subgoals that are fully fleshed-out in the plan itself, but are indicated below only by key-word descriptors in parentheses.

—JANET DICKSON

GOALS

GOAL 1
To 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
To selectively 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
To 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
To strengthen the IFs system, linked to appropriate data and other Pardee Center tools, and to enhance its long-term viability
(the model; modeling team and personnel; processes; awareness, perception, and use)

GOAL 5
To enhance and increase students' learning experiences and professional development
(coursework; research opportunities; internships; alumni network)

GOAL 6
To 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
To 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
To 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)

Together, Korbel School and University leadership have endorsed these goals and we have now moved to a 5-year implementation plan in which all Center personnel are participating. Progress toward the goals will be evaluated quarterly and adjustments in action steps made if needed.

Implementation Plan

Following confirmation of the Pardee Center's Five-Year Strategic Plan, the Pardee Center developed a series of action steps necessary for achieving each of the strategic goals and subgoals detailed. The action steps were compiled into an Implementation Plan Outline and sequenced based on how efforts might logically unfold over the next five years. The Pardee Center team then formed working groups to review Year One priorities and to collaboratively expand upon and refine efforts. For example, to address the Pardee Center's Strategic Goal #3 focused on expanding and improving our participation in, and contributions to, academic and scientific communities, six members of the Center's team identified key journals for targeted publication, developed further authorship norms to guide an inclusive and equitable process, and focused on opportunities for participation in academic conferences. Other efforts included, but were not limited to, supporting an internal IFs user base, leveraging partnerships to offer professional development opportunities to Research Aides, improving the Center's onboarding processes (see below), developing our internal governance structure to include greater opportunities for leadership among staff, and outlining an intentional and rigorous approach for expanding our International Futures model. Moving forward, the Pardee Center team will meet quarterly to review progress and plan future work. The Implementation Plan is a working document that will (and is intended to) change, though we anticipate our strategic goals and subgoals will change only in rare circumstances (if at all) over the five-year period. For example, our anticipated efforts in Year 4, Quarter 3 will likely need adjusting as that time approaches—but we are committed to achieving the strategic goals and subgoals that they were developed to support.

—WHITNEY DORAN

Implementing Onboarding

The need for a formalized onboarding process at the Pardee Center was identified by Center staff last spring during the all-staff strategic planning kickoff meeting and by individual staff members in follow-on interviews. In part, this need for a more formalized process developed because of a change in the Center's hiring practices. In distinction from earlier periods when the Center largely hired internally from within the University community, many recent new employees had been hired externally and had little prior exposure to University processes and to the International Futures (IFs) tool in particular.

A multi-step process was developed and implemented to address these needs. Onboarding begins on the new employee's first day of work with a presentation that includes an overview of our history as a center, a snapshot of current research projects, and administrative information. Following the presentation, new employees are given a welcome packet that includes an onboarding checklist, an Employee Handbook, and other documents.

At this time the new employee is matched with an "onboarding buddy" who offers support during the new employee's first months at the Center. This individual—different from the new employee's supervisor—meets regularly with the new employee and serves as a point of contact for any onboarding questions that arise. The first week of work for the new employee concludes with a Pardee Center happy hour to welcome and celebrate the new team member. The onboarding continues for a few months with ongoing support from the "onboarding buddy" and regular supervisor check-ins to help the new employee become a productive member of the team.

The next step in the onboarding implementation plan, currently under development, is a more formal system to help new research staff as they come up the learning curve on IFs and its uses.

—ANAJULIA BARNEY

PARDEE CENTER

VISION

INCREASED KNOWLEDGE
FOR FUTURE WELLBEING

MISSION

We build and use data and
tools to analyze our complex
world and the long-term
dynamics of change in human,
social, and natural systems.

We share our resources
with policymakers, academics,
and others seeking to improve
the ways we contemplate and
plan for the global future.

VALUES

Interconnectedness

BRINGING TOGETHER IDEAS &
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 & 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, & TRUSTWORTHINESS

From our modeling assumptions and tools to the way
we work with others, we strive to be as open and as
accessible as possible. We deliberately communicate the
limitations of our work as well as its strengths.
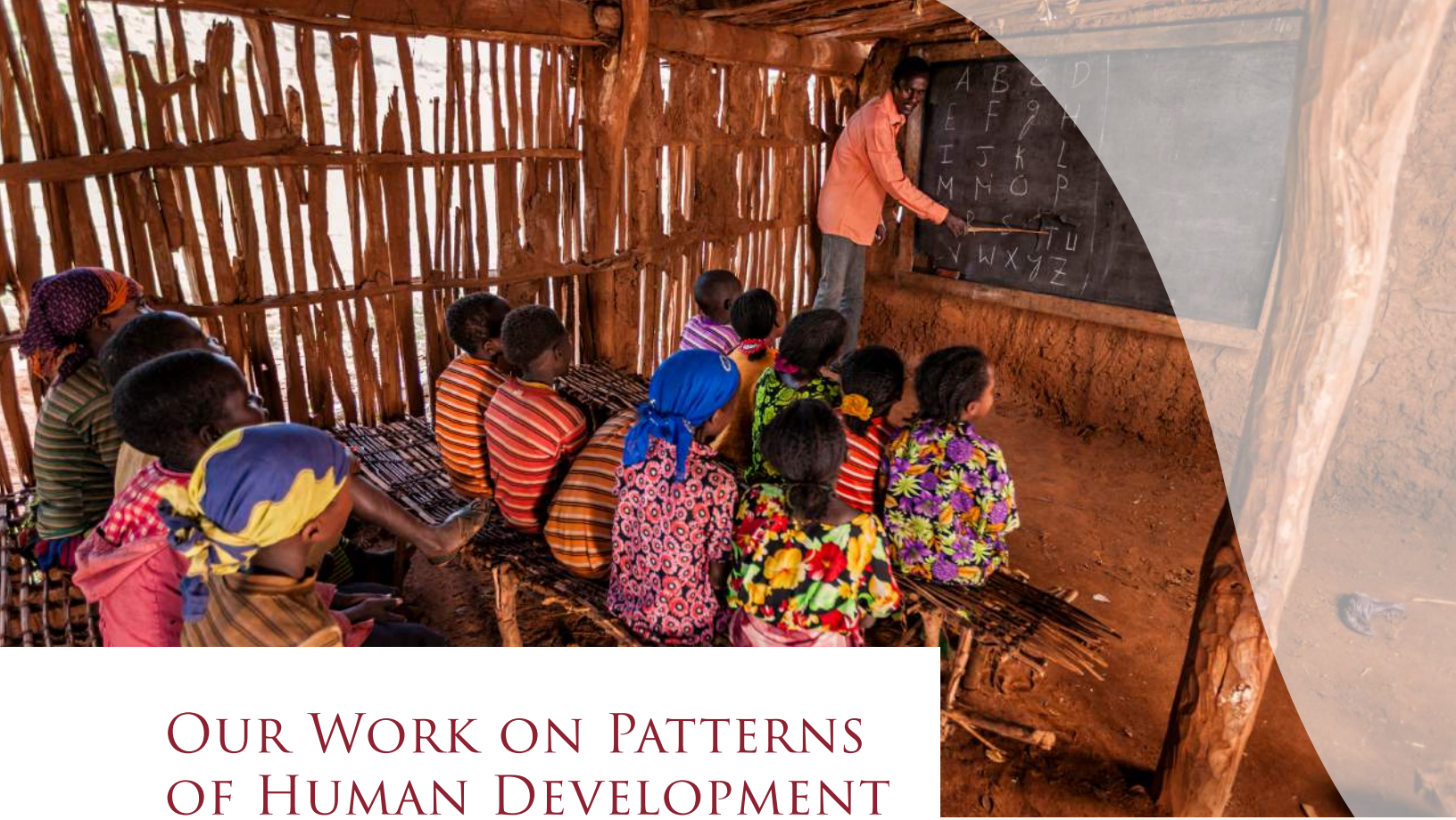
Our Work on Patterns of Human Development

The Center's work in this area is currently predominantly focused on progress, and impediments to progress, toward the Sustainable Development Goals (SDGs). The ultimate metrics—health, education, income, and gender equality—relate to human wellbeing, but even in this area the outcomes are substantially driven by social

> The ultimate metrics—health, education, income, and gender equality—relate to human wellbeing, but even in this area the outcomes are substantially driven by social and physical variables.

and physical variables. For example, in terms of social variables in the project descriptions below, the effects of conflict in Yemen on SDG progress was a key focus of work with the United Nations Development Programme

(UNDP) this past year. With respect to physical systems, policy interventions around agriculture and food security have been one focus of our past work with the African Union Development Agency's New Partnership for Africa's Development (AUDA-NEPAD) and this year with the Overseas Development Institute in exploring the trajectory of poverty, and opportunities for alleviating it, at national and provincial levels in Zambia. The project with United Nations Women also focused on poverty but with a different emphasis—namely, the disparities between women and men living in poverty.

In addition to the analysis of prospects for achieving the SDGs, a second focus of our work is on analytical capacity-building within governments and organizations whose missions involve strategic policy decisions to support and enhance the conditions that facilitate human development. The International Futures system, supplemented by other tools, is central to both the analytic studies and the capacity-building activities in our current projects with AUDA-NEPAD and UNDP.

Our Partnership with AUDA-NEPAD

For almost a decade the Pardee Center has worked with the African Union Development Agency's New Partnership for Africa's Development (AUDA-NEPAD). The Center views its role as support for the core mission of AUDA-NEPAD, which is the elimination of poverty, advancement of sustainable economic growth, and promotion of regional integration across the continent. Previously-completed projects focused on analysis of Agenda 2063 (Africa's vision and action plan), food security, and continental transformations.

During 2019-2020 the Center completed a project focused on the impacts of the African Continental Free Trade Agreement and presented project findings at the African Union Heads of State Summit in Addis Ababa in February 2020. Later in 2020, the Center signed a Memorandum of Understanding with AUDA-NEPAD that initiated a new three-year project with three components: (1) training in the use of the International Futures (IFs)

tool to support further development of analytical capacity-building within AUDA-NEPAD across key AU development priorities; (2) continent-wide networking and technical training for government planners and analysts through improved access to analytical tools, strategic information, and peer learning; and (3) creating Strategic Knowledge pieces, forecasting studies, and other research products (including enhancements to IFs) for member state planners and analysts in support of Agenda 2063 priorities.

—ABIGAIL (ABBY) KABANDULA

Our Partnership with UNDP

Since 2017, the Pardee Center has engaged in a research partnership with the United Nations Development Programme (UNDP) focused on the use of the International Futures (IFs) tool for analysis of progress toward the Sustainable Development Goals (SDGs). Our earliest projects focused on producing country-level trend reports and providing training workshops to build analytic development capacity among policymakers and stakeholders. Over the past year our collaborations have been expanded and strengthened through the increasingly innovative research and training projects described below.

In September 2019, we published the second of a set of reports analyzing the impact of conflict in Yemen. Earlier that year, we produced a report using IFs to estimate the human and economic development cost of war in Yemen. The second study, "Assessing the Impact of War in Yemen on Achieving the SDGs," expanded on that work by modeling the impact of sector-specific interventions in the context of ongoing conflict. We focused on four SDGs: No Poverty (SDG 1); Zero Hunger (SDG 2); Decent Work and Economic Growth (SDG 8); and Reduced Inequalities (SDG 10). We found that, though targeted interventions could alleviate some of the war's damage,

the only scenario allowing development to eventually return to pre-conflict levels was one in which the war is ended. Several Pardee Center researchers traveled to the United Nations headquarters in New York City to meet with partners there and to present the report.

We started four new projects with various UNDP offices In early 2020. In March, UNDP Nigeria commissioned the Pardee Center to analyze the impact of conflict on development in three states in northeast Nigeria. In April, we began a partnership with the UNDP Regional Bureau for Arab States and Sudan Country Office for a study assessing development possibilities in Sudan.

A third project through UNDP Regional Offices in Africa will utilize new scenarios created in IFs to model some of the impacts of COVID-19. In a joint effort with the University of Pretoria's Gordon Institute of Business Science and the Institute for Security Studies, we will explore the macroeconomic effects of COVID-19 on

sustainable human development for 10 states in sub-Saharan Africa. Our conceptual framework for analysis of the macroeconomic impacts of COVID-19 distinguishes impacts on the health dimension, a domestic governance dimension, and an international relations dimension. Using this framework, we are building scenarios to explore the impact of COVID-19 on long-term human development at the state level.

The fourth project is a large-scale training program for UNDP Resident Representatives, Country economists, and other interested staff in the use of the newly-developed COVID-19 features in IFs. Virtual training sessions consist of three courses, each structured in four weekly sessions. The first course, focused on the macroeconomic impacts of COVID-19, began on July 14th with 118 registrants from 46 countries.

—TAYLOR HANNA WITH WILLEM VERHAGEN

ODI Zambia Project

Over the past year, the Pardee Center has collaborated with the Overseas Development Institute (ODI) to explore the potential long-term future of poverty in Zambia at national and provincial levels. In the resulting report, "The Future of Zambian Poverty to 2060," the Pardee Center assessed long-term poverty across a Current Path scenario that assumes continuation of the current trajectory. A variety of alternate scenario types were also explored, including framing scenarios (understanding the uncertainty space), strategic policy interventions (simulating potential policy priorities), and a counterfactual

analysis exploring the possible impact of the COVID-19 pandemic. We found that although there are broad development uncertainties in Zambia, poverty is likely to remain a critical issue for the country throughout the period included in the study (from now until 2060). Even so, our analysis suggests that there are significant opportunities to reduce rural poverty through targeted interventions in agriculture, family planning, and social cash transfer programs.

—MICKEY RAFA

UN Women Project

More women than men live in poverty, and the Pardee Center has partnered with United Nations Women to explore the long-term trajectory of such disparities. The project aims to answer questions such as: How are differences in the share of men and women living in extreme poverty expected to evolve over time? How long will it be before the difference in poverty rates between men and women disappears? What can be done to accelerate the closing of this gap? To answer these questions the International Futures model was extended to include an age-sex representation of extreme poverty. We found that 410 million women, 10 percent of all women, live under the extreme poverty threshold. Our work has highlighted

disparities for women especially in sub-Saharan Africa and also for younger women (for example, globally in the 25 to 34 age group, 7 million more women than men live on less than $1.90 per day). For women and men combined, we estimate that a minimum investment of $170 billion would be required to eliminate extreme poverty in 2020. Assuming annual transfers are maintained as needed over time, this would amount to a cumulative $2 trillion by 2030. Our analysis will appear in a forthcoming project report titled "Modeling the Sex-Difference in Poverty."

—DAVID K. BOHL

Our Work on Patterns of Societal Development

The representations in International Futures (IFs) of domestic and international sociopolitical systems have roots in work reaching back across two decades. Specifically, a model of international political power and threat of interstate conflict took shape in work that supported the project's contributions to three earlier Global Trends reports of the U.S. National Intelligence Council (NIC). That was followed by the development of a model of domestic governance and political stability that served as the core of the Strengthening Governance Globally volume in the Patterns of Potential Human Progress series.

Recent and ongoing work continues to enhance understanding of those systems. Our project through the Minerva Research Initiative has strengthened understanding of state fragility and is linking our thinking about it to the academic community and literature. We are working with the NIC to explore trends and potential trajectories for a number of demographic issues from health and education to migration flows. Through the groundbreaking work of our Diplometrics Program we have compiled databases of new information that is now being used to support innovative analyses of state power and dyadic influence. The Diplometrics Program has also enabled variables to be added to IFs related to the unfolding of international relations, ranging in focus from diplomatic connections to shared intergovernmental organization

> Recent and ongoing work continues to enhance understanding of domestic and international sociopolitical systems.

membership. It has also enabled greatly expanded representation of bilateral relationships of states. Together these past and current efforts support the Center's goal of increasing our connections with scientific and academic communities as well as enhancing contributions to policy analysis.

Minerva Research Initiative

The U.S. Department of Defense (DoD) Minerva Research Initiative encourages university-based social science research in the field of open-source security studies. Its goal is "to improve the DoD's basic understanding of the social, cultural, behavioral, and political forces that shape regions of the world of strategic importance to the U.S."

The Pardee Center was awarded a five-year Minerva grant in 2014, subsequently extended through February 2020. Our project, titled "Taking Development (Im)balance Seriously," elucidated the structural factors that drive domestic political instability and state failure across time. In addition, the project funded the development of data and tools, including the enhancement of the state fragility model in the International Futures modeling system; the Major Episodes of Contention database (led by Erica Chenoweth and Sooyeon Kang); and a repository of 50 case studies of episodes of state failure (led by Oliver Kaplan).

Pardee Center researchers have conducted briefings on project findings in a variety of policy settings including the African Union Development Agency's New Partnership for Africa's Development (AUDA-NEPAD), the German Foreign Federal Office, the U.S. State Department, USAID, and others. An article by Jonathan Moyer and Oliver Kaplan drawing on the project appeared in Foreign Policy magazine in July 2020 ("Will the Coronavirus Fuel Conflict?"). Earlier publications include an article in the British Journal of Political Science and a policy brief published by the Institute for Security Studies.

Two additional pieces based on the project are nearing completion. One identifies four clusters of variables that drive state failure (in distinction from more typical model forecasts using a single set of driving variables). The second focuses on structural imbalances in development as drivers of instability. Examples of structural imbalances include such things as a mixed governance regime or an imbalance in school enrollment rates between girls and boys.

—MELISSA SHAMBACH
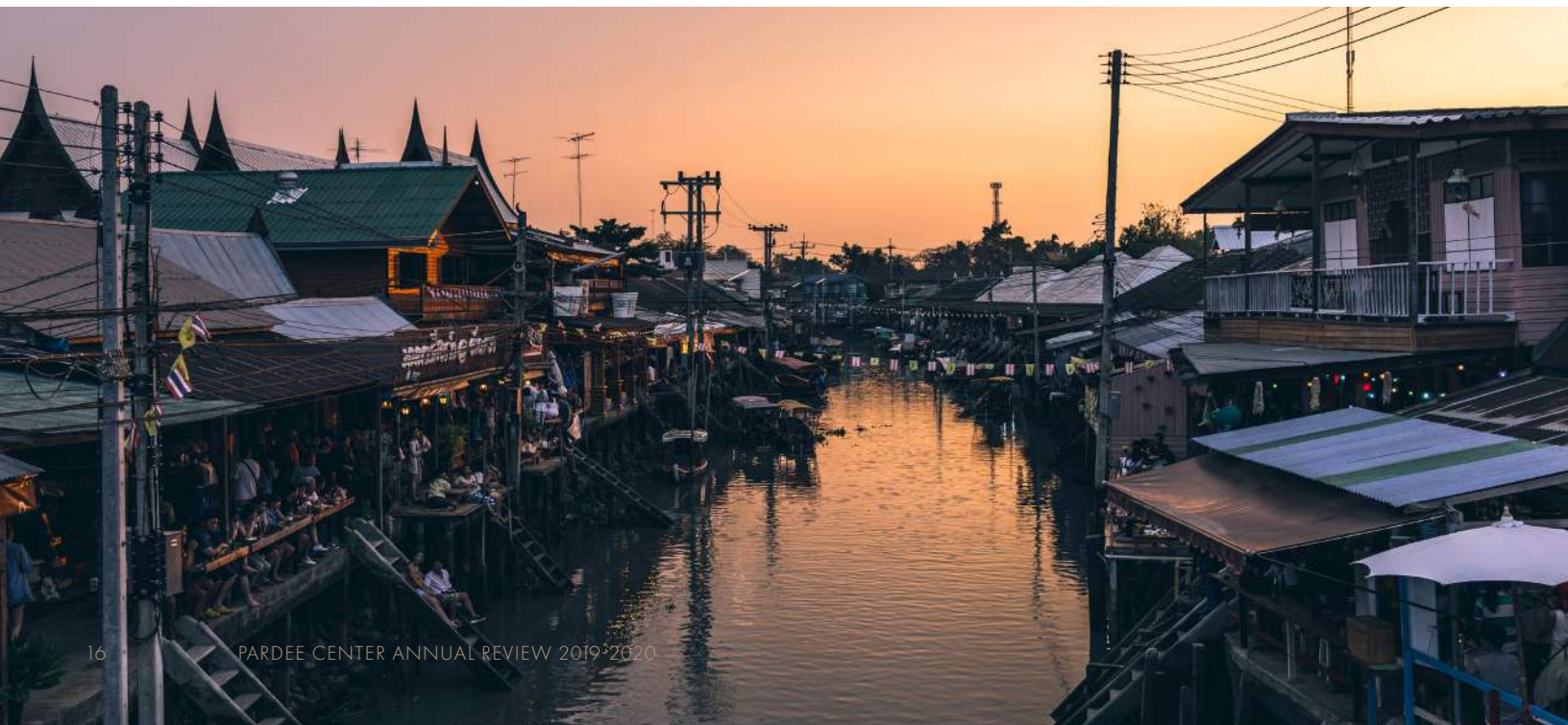
Global Trends

The Pardee Center contributed to three earlier National Intelligence Council (NIC) Global Trends reports—namely, those that looked out to the years 2020 (in 2004), 2025 (in 2008), and 2030 (in 2012). The Center is currently helping the NIC explore trends and potential trajectories for a number of issues from health and education to migration flows for its forthcoming Global Trends report.

As part of this work, Pardee Center researchers have sought to establish a foundation of "knowable" trends, exploring questions of what is unknown, what is likely, and how policymakers might appropriately respond to long-term global challenges. Insights from our research are also characterizing the likely impacts of COVID-19 on issue areas ranging from human development to great power competition. Exploration into these and related issues is expected to continue as part of this project through early 2021.

—COLLIN MEISEL

GLOBAL TRENDS REPORTS
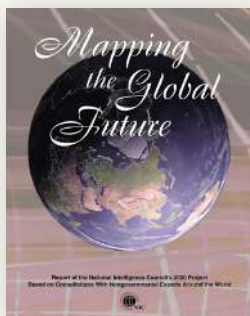
GLOBAL TRENDS 2020:
Mapping the Global Future

GLOBAL TRENDS 2025:
A Transformed World

GLOBAL TRENDS 2030:
Alternative Worlds

For the latest edition of this quadrennial report, our role has been to produce a document of baseline trends in global development across issue areas as well as visualizations that reflect changing patterns of development in health.

Diplometrics Program

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. Diplometrics focuses on dyadic state interactions that measure the depth and breadth of political, diplomatic, economic, security, and cultural ties between countries. The primary goal of the Diplometrics Program is to define what the international system actually is and to explore how states and other actors operate within its boundaries.

Diplometrics began in 2011 when data collected as part of the International Futures (IFs) modeling effort were further developed to forecast the first iteration of the Global Power Index, a measure of national power featured in the National Intelligence Council's Global Trends 2030 report. Over the next two years, data on Diplomatic Representation, International Governmental Organizations, and Multilateral Treaties were gathered and compiled into datasets to help better understand global diplomatic networks. These three data series were then forecast in IFs and converted from monadic to dyadic data to better understand shared affinity within global networks.

The Diplometrics Program has expanded significantly since those early stages to include data on military capabilities, non-state actors, foreign travel by heads of government and state, diplomatic capacity, cultural affinity, and power projection, among numerous other data initiatives. With our forthcoming Global Indicators of Dyadic Engagement dataset, we will seek to combine these initiatives, analyzing and forecasting bilateral and networked influence across the international system.

Building on these foundations, Diplometrics is now moving into an analytically-focused phase, contributing to conversations about international relations and politics in both academic and policy arenas. We look forward to continuing and expanding these activities in the coming year.

Since its inception, the Diplometrics Program has been funded by the U.S. National Intelligence Council; the U.S. Army Future Studies Group; the U.S. Army Research Office; the U.S. Department of Defense Minerva Research Initiative, and others. Along the way, hundreds of students have contributed to the Diplometrics Program in meaningful ways, and we eagerly welcome their continued support.

— COLLIN MEISEL

U.S. INFLUENCE CAPACITY IN 2018
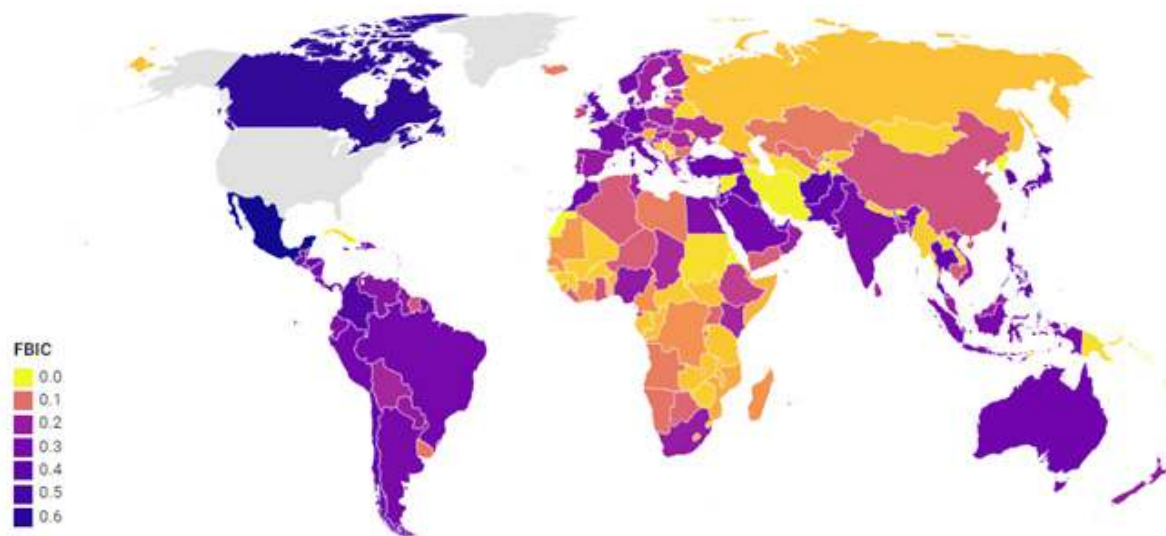
▶ U.S. influence capacity abroad in 2018, as measured by the Diplometrics program's Formal Bilateral Influence Capacity index

DIPLODASH
VOTESTER

DIPLOMACY DATA
- Diplomatic Representation & Services
- Multilateral Treaties
- International Organizations
- Country & Organization Leader Travel
- UN Voting Patterns
- WTO Disputes & More

MEASURES OF POWER
Material Capabilities Indices:
HHMI · GPI · DiME

SECURITY DATA
- Military Equipment Index
- Arms Trade Stocks
- Total & Disaggregated Military Spending Stock
- Military Alliance Index & More

**INTERNATIONAL
FUTURES**

ECONOMIC DATA
- Multinational Enterprises
- Trade Agreement Index
- Bilateral Trade & Tarriffs
- Trade Complimentarity Index
- Foreign Aid & Remittances
- FDI, Portfolio Investment, Global Value Chains & More

CULTURE DATA
- Religious Similarity Index
- Language Similarity
- Migration & More

GIDE
MEASURES OF INFLUENCE
Bandwidth · Dependence · FBIC

Analytic Work with Diplometrics Datasets

The Diplometrics Program has been engaged in producing a number of works in the field of international relations that engage the academic and policy arenas. Most recently, Jonathan Moyer, Sarah Turner, and Collin Meisel had a special data feature accepted for forthcoming publication in the *Journal of Peace Research* titled "What are the Drivers of Diplomacy? Introducing and Testing New Annual Dyadic Data Measuring Diplomatic Exchange." This data feature introduces the Diplometrics Diplomatic Representation data set. These data and the analysis presented in the article represent an important contribution to better understanding diplomacy's role in international relations.

This past year, team members also participated on panels at several academic conferences. Austin Matthews and Collin Meisel were invited to the Joint Annual Meeting of the International Security Studies Section of the International Studies Association and the International Security Section of the American Political Science Association in Denver in October 2019. Austin presented a paper evaluating United States trade forecasts and regional influence; Collin delivered a work on migration policies and national security outcomes. Austin also presented at the August 2019 annual conference of the American Political Science Association in Washington D.C. He delivered a work on forecasting dyadic intergovernmental organization membership, co-authored with Jonathan Moyer, David Bohl, and Collin Meisel.

Additionally, Jonathan Moyer, Collin Meisel, former Pardee researcher Andrew Scott, Whitney Doran, Research Aide Marianne Hughes, and Austin Matthews have been using the Country and Organization Leader Travel dataset to explore whether official travel by heads of state is a leading indicator of increased bilateral trade and foreign direct investment. Following these efforts, the team plans to analyze the structural drivers of heads of government and state travel with an overarching goal of more clearly defining interactions between various units of analysis within the international system.

Meanwhile, Jonathan Moyer, Austin Matthews, and former Pardee researcher John McPhee have begun to leverage insights from the forthcoming Big International Non-Governmental Organizations (BINGO) dataset, which tracks programmatic aid from 1990 to 2015 distributed by the largest international non-governmental organizations across the world. By examining where these organizations operate and derive support, the team will highlight their understudied role within the broader context of international interactions.

In light of these and other efforts, the Diplometrics team is looking forward to continuing to expand the program's research output in the coming year.

— AUSTIN MATTHEWS

DIPLOMETRICS

BY THE NUMBERS

COUNTRY AND ORGANIZATION LEADER TRAVEL

Biographical Observations:
Seventeen biographical variables for **1,257** current and former heads of government and state

Trips by World Leaders:
Over **1,000** international trips taken by world leaders

DIPLOMATIC REPRESENTATION

Nearly **10,000** observations of diplomatic exchange

INTERNATIONAL ORGANIZATIONS

More than **130,000** new international organization observations

GLOBAL INDICES OF DYADIC EXCHANGE

More than **300** variables for over **200** countries from **1960** onward, totaling nearly **2,000,000** observations

MILITARY EQUIPMENT INDEX

A new index finalized by combining weighted indices data on a broad variety of military equipment for all nations from **1970** through **2015**

MULTILATERAL TREATIES

More than **170,000** new observations for multilateral treaty signing and ratification data

MULTINATIONAL CORPORATIONS

More than **1,000** new observations recorded

UNITED NATIONS GENERAL ASSEMBLY

More than **100** votes recorded

Our Work on Interactions Between Human, Social, and Biophysical Systems

The Center's capacity to contribute in a significant way to research on biophysical sustainability and its connection to multiple aspects of human and social development was strengthened when Brian O'Neill came to the Center two

Additions to the team are strengthening the Center's capacity to contribute to research on biophysical sustainability and its connection to multiple aspects of human and social development.

years ago and again when Willem Verhagen joined the Center in April of this year. One outcome is that biophysical components in International Futures (IFs) are being enhanced and then integrated with other components of the system. The project that Willem led with the Landesa Rural Development Institute is one such example.

Beyond adding new capabilities to the IFs system, Brian and Willem have connected the Pardee Center to scientific communities through their work with sustainability-oriented integrated assessment modeling groups around the world. Brian in particular has long-standing connections with that community, including his key role in developing the Shared Socioeconomic Pathways and his authorship role in the unfolding Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Brian will be leaving the Pardee Center soon to become the director of the Joint Global Change Research Institute in College Park, Maryland. We wish him the best and look forward to ongoing and new collaborations with him in his new role.

Drawing on the diverse expertise represented across the entire Pardee Center team, we look forward to furthering both the depth and the breadth of the Center's work connecting human, social, and natural systems in support of a sustainable future.

Land Tenure Collaboration with Landesa

Across the world, many people directly depend on the land they possess for resources such as food, feed, and fiber. However, in many countries security of land tenure is low, limiting the level of investment in land for longer-term development. Academics and development agencies have assessed some of the shorter-term, diverse impacts of securing land tenure. The Pardee Center, in partnership with Landesa Rural Development Institute, analyzed the longer-term impacts on human development from secure land tenure. We conceptualized land tenure security as a multi-dimensional and interconnected system of formal land rights, perceived land tenure security, and equality for women in land rights. Building on this conceptualization, we are working on a position paper on how to use the International Futures (IFs) model to study the effects of increasing land tenure security on human development. The paper outlines the key relationships of interest including land tenure security on agricultural production, soil conservation management, and women's decision-power. We provide an overview of existing data and identify data gaps to enable such analysis. This position paper ideally builds toward further integration of the IFs model components of land governance and the agricultural economy and provides the opportunity to expand the current functionalities of the IFs agricultural model.

— WILLEM VERHAGEN

Shared Socioeconomic Pathways Literature Review

Shared Socioeconomic Pathways (SSPs) are alternative scenarios of future societal change. They were created primarily for supporting climate change research and are designed to reflect conditions that present different levels of challenges to mitigation and adaptation. These conditions are described both as narratives and as quantitative societal variables. They are one element of an integrated climate and societal scenario framework, including climate projections based on greenhouse gas scenarios called Representation Concentration Pathways.

In February of 2019, the Pardee Center began a literature review of papers that include the use of SSPs. The goal was to produce a paper reviewing the use of SSPs and how they are integrated into varying types of studies. Initially, papers were used from the University of Washington's ICONICS database. The review since expanded from 600 papers to over 1,250 through extended searching by project researchers.

In order to capture how the SSPs were being used, papers were coded according to topical focus, the integration of the SSP scenarios with climate projections, and various other markers. Through this process it was possible to analyze whether and how the SSPs were being used appropriately in an integrated scenario structure.

Preliminary information about the project was presented at the international Scenarios Forum at the University of Denver in March of 2019. The project has since been completed and the analysis of the literature has culminated in a paper currently titled "Achievements and Needs for the Climate Change Scenario Framework" that is under review.

— CAROLE GREEN

COVID-19 AND CLIMATE CHANGE

AN INTERVIEW WITH PARDEE CENTER DIRECTOR OF RESEARCH, BRIAN O'NEILL

In the spring of 2020, as the COVID-19 pandemic hit the United States, leading to the Pardee Center's move to at-home work, Brian was interviewed remotely by Alyssa Hurst from the University of Denver Newsroom on the pandemic's impact on climate change. Brian's career has been focused on climate and related societal projections, including his role as member of the Intergovernmental Panel on Climate Change (IPCC) and his work with the Shared Socioeconomic Pathways (SSPs). Brian's responses to the interviewer's questions contextualize this aspect of the Pardee Center's work by presenting the implications of climate change in an accessible way. Below is an excerpt from that interview.

Interviewer: International responses to COVID-19 have been varied. Are there places around the world that have experienced a more dramatic/less dramatic environmental impact as a result?

Brian: It's hard to tell yet how different the effects on carbon emissions have been from place to place. We'll need to wait for more data to come in to know that. But we do see a different impact on the environment that is striking already: reductions in local air pollution. Unlike climate change effects, effects on air quality occur very quickly. Local air pollutants often come from the same sources as carbon emissions, like driving cars and trucks or producing electricity. So the decrease in the [number of] vehicles on the road has improved air quality fairly dramatically in many cities around the world, including places in the U.S. like Los Angeles, but also in large urban areas like Delhi and Beijing, and many other places.

But here again, improved air quality is happening for the wrong reasons. We haven't suddenly produced cleaner burning car engines or less-polluting power plants. We have crashed the economy, which is not a solution to any environmental problem.

Interviewer: What does the international response to COVID-19 teach us about combating climate change, surely another pressing threat to humanity?

Brian: The two issues are very different, not least because of the timescale. There are no projected impacts of climate change that are anticipated to be so sudden and at the same time so widespread. But from a broader perspective, it does demonstrate that the global community can make very large changes very quickly, given a strong enough motivation. Some of the discussions around the climate change issue have been about the feasibility of acting fast enough to meet the international goal of limiting warming to 2 degrees. So we do see now that fast action is possible. But even in this case the analogy is not all that strong, since the climate action has to be sustained over several decades.

Interviewer: Has this pandemic had any noticeable effect on how people see the relationship between climate and human health?

Brian: Some people have argued that the event could, or should, make us more aware of the connection between the environment and health, and therefore of climate and health. That might happen, but I am not sure that connection will be made in many people's minds. Climate does not appear to be a key factor in causing the pandemic, and while climate change is projected to have important effects on health, substantially increasing the risks of pandemics is not one of them.

INTERVIEW EXCERPTS BY CAROLE GREEN

Progress toward the IPCC Sixth Assessment Report

The international climate change research community is in the middle of the process of preparing one of its periodic major assessment reports. Currently in its sixth incarnation, this report from the Intergovernmental Panel on Climate Change (IPCC) has been produced every six or seven years since 1990. It is one of the major inputs into the international climate policy negotiations held under the auspices of the United Nations Framework Convention on Climate Change.

The report consists of three volumes, each of 15 or 20 chapters. I am a co-lead of one of the chapters in the volume on climate change impacts, adaptation, and vulnerability. Our chapter is on the "Key Risks" of climate change; that is, the risks that have the potential to become severe if we don't take action to reduce emissions or adapt to a changing climate. This could include anything from the impact of rising sea levels on coastal communities, to deaths from heat waves, to consequences for food security, conflict, and migration. Our job is to synthesize what we know about the extent to which climate impacts are already occurring, the extent to which communities are already beginning to adapt, and under what conditions of future development and climate change the risks may become especially high. The chapter is challenging not only because of its content, but also because it draws on results from across 15 other chapters in the volume, requiring extensive interaction with authors across many disciplines and regions.

Writing an IPCC report is a large, complex process involving a number of formal steps over several years designed to ensure the quality of the ultimate outcome. The report goes through an informal first draft, then three formal drafts, each of which is followed by an open review process in which experts and representatives of governments from around the world comment on the text of all the chapters. It is not unusual to have more than a thousand review comments on any given chapter, each of which must be responded to, with the comments and the responses from each round eventually being made public. The underlying scientific literature is also constantly evolving as new papers are published and must be accounted for in the assessment.

The past year began with a hard deadline for completing our first formal draft of the chapter, which then was sent out for expert review. In January, the 200+ authors of our particular volume met in Portugal to discuss the review comments and plan the second draft. The COVID-19 pandemic has presented a major obstacle to progress on the report, slowing down or halting many authors' ability to continue to contribute. Deadlines have been pushed back as a result, but work goes on, with the aim of finalizing the second formal draft this fall. A third formal draft is scheduled for some time in 2021, with release of the report thereafter.

— BRIAN O'NEILL

▶ *Brian O'Neill (far left) and co-authors of the chapter on Key Risks of climate change in the IPCC Sixth Assessment Report.*

People of Pardee

Research Aide Project Leads

The Pardee Center is honored to work with Research Aides studying at the University of Denver. Research Aides contribute meaningfully to the Center's project portfolio and to the development of an enriching and rigorous research community. Project Leads are those Research Aides who have demonstrated an especially deep commitment to the Center's mission and who have taken on a leadership role within their project teams. We would like to celebrate our recently graduated Project Leads whose contributions will be long lasting and congratulate our new and returning Project Leads who will continue to advance their projects' research agendas.

GRADUATING PROJECT LEADS

ARHIN ACHEAMPONG
Degree Program: MA International Security, Certificate in Humanitarian Assistance
Pardee Center Project: Deputy Project Manager

ASHLEY ELSASSER
Degree Program: BA International Studies, minor in Spanish
Pardee Center Project: Communications Team

CAROLINE PLANTE
Degree Program: MA International Development, GECA Certificate
Pardee Center Project: Core Diplometrics

DAVID CARLISLE
Degree Program: MA International Studies
Pardee Center Project: Diplomatic Services

HOLDEN FITZGERALD
Degree Program: MA Global Finance, Trade, and Economic Integration; specialization in China
Pardee Center Project: Literature Review Team

JOE ENGELS
Degree Program: MA International Security
Pardee Center Project: Military Inventory Project

KAYLIN MCNEIL
Degree Program: MA Global Finance, Trade, and Economic Integration
Pardee Center Project: IFs Data Team

RAGHAV GUPTA
Degree Program: MA Global Finance, Trade, and Economic Integration
Pardee Center Project: IFs Data Team

SARAH GUTBERLET
Degree Program: MA International Security
Pardee Center Project: Military Inventory Project

INCOMING AND CONTINUING PROJECT LEADS

AILI MAKELA
Degree Program: BA International Studies
Pardee Center Project: Diplomatic Services Team

ANDREW WOODWARD
Degree Program: MA Global Finance, Trade, and Economic Integration
Pardee Center Project: IFs Data Team

JACKIE SHI
Degree Program: PhD in Research Methods and Statistics, Morgridge College of Education
Pardee Center Project: Data Visualization and Analysis Team

KATHERINE LABOMBARDE
Degree Program: MA International Development, GECA certificate
Pardee Center Project: Core Diplometrics

MALLORY CANNON
Degree Program: BA International Studies
Pardee Center Project: Literature Review Team

MARIANNE HUGHES
Degree Program: MA International Studies
Pardee Project: Country Organization and Leader Travel

NICHOLAS RIDLEY
Degree Program: MA International Studies
Pardee Center Project: Deputy Project Manager

VIVIAN YANG
Degree Program: MA Global Finance, Trade, and Economic Integration
Pardee Center Project: IFs Data Team

Celebrating Research Aide Fellowships

Asabea Amaniampong
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. Asabea will be studying the Ghanaian language Twi, first in an intensive online summer program through the University of Florida and then at the University of Ghana – Legon in Accra, Ghana.

Joe Engels
PRESIDENTIAL MANAGEMENT FELLOWSHIP

The Presidential Management Fellowship is a prestigious, two-year post-graduation leadership development program that provides training and a variety of work assignments within the federal government.

Haylie Castor
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. Haylie will be working at the Department of Homeland Security in the Office of Intelligence and Analysis. She will be interning virtually in the Economic Security Mission Center.

KAYLIN McNEIL

Beginning in 2017, each year the Pardee Center and the United Nations Development Programme (UNDP) have collaboratively selected a Research Analyst Intern to support UNDP's Strategic Policy Unit headquartered in New York City. The intern provides research support on a broad range of sustainable development issues, with an emphasis on quantitative research and analysis.

In the summer of 2019, Kaylin McNeil assumed this role, leveraging her understanding of the International Futures (IFs) model, gained during her time as the Pardee Center's IFs Data Team Project Lead, and development policy from her studies at the Korbel School. As UNDP's Research Analyst Intern, Kaylin contributed to an IFs report on governance in North Macedonia and original analysis on the United Nations Peacekeeping Operations' potential influence on foreign direct investment. Kaylin noted that she appreciated the opportunity to take on responsibility within the organization and to engage with various assignments that emphasized her skills. To anyone looking to work in development, she highlighted the importance of understanding the IFs model, developing strong analytical skills, and becoming familiar with country-level development policy.

Kaylin has been a valuable member of the Pardee Center team and earned her master's degree from the Korbel School in Global Finance, Trade, and Economic Integration in June 2020. She hopes to pursue a career in sustainable finance.

Pardee Center Research Aide and IFs Data Team Project Lead Vivian Yang was selected to be the Pardee Center's summer 2020 Research Analyst Intern with UNDP. Vivian has successfully completed her internship, which will be further highlighted in next year's annual review.

— CAROLE GREEN

ALANNA MARKLE

Alanna worked for the Pardee Center from 2015 to 2019, first as a graduate student and then as a Research Fellow following completion of her master's program. She has since become one of our many former students to go on to a career in international relations and public policy.

During her four years at the Pardee Center, Alanna contributed to a variety of projects, ranging from the Diplometrics Program's Global Power Index to the Western Cape Government's strategic plan, even completing an internship with the Institute for Security Studies (ISS) in South Africa. After graduating from the Korbel School in 2017, Alanna worked with the Western Cape Government Strategic Foresight unit and the ISS. There she worked as a researcher, using the International Futures modeling tool to provide insights for policy design and planning. She noted how the Pardee Center was a fundamental part of her Korbel experience and set her professional trajectory toward future-oriented research and policy spaces. In her current role at the Organisation for Economic Co-operation and Development, Alanna's work focuses on helping national governments make policies adaptable to variable future environments. She is currently working on COVID-19 related policy adaptations and is based in London. Alanna's advice to Pardee Center Research Aides is to give one hundred percent to any job they hold.

— MELISSA SHAMBACH

ABIGAIL "ABBY" KABANDULA

Abigail "Abby" Kabandula joined the Pardee Center as a Research Scientist in March 2020. She is a Zambian-born global governance and human security expert. Abby holds a master's degree in Historical Studies from the University of Cape Town and a PhD in Global Governance and Human Security from the University of Massachusetts Boston. Abby defended her dissertation in May of 2019 on the efficacy of the African Peace and Security Architecture for policy on transnational security in fragile states, for which the University of Massachusetts recognized her with the 2020 GGHS Excellence in Dissertation Research Award.

Before coming to the Pardee Center, Abby worked as a researcher at the Center for Conflict Resolution and the Center for Social Science Research in Cape Town. Abby has also worked extensively with non-profit and civil society organizations across Southern Africa as a democracy program associate in Cape Town.

Abby's expertise spans complex issues in international development, security, and the environment. At the Pardee Center, Abby's research to date has focused on various African Union Development Agency projects and supported various other projects. Outside of work, Abby enjoys bike riding, playing tennis, reading English and African literature, and traveling internationally.

— MELISSA SHAMBACH

NEW STAFF HIGHLIGHT:

WILLEM VERHAGEN

Willem Verhagen joined the Pardee Center as a Research Scientist in April 2020. Willem's interest in sustainability and land management began when he studied Earth & Economics at Vrije Universiteit in Amsterdam. Since then his focus on sustainability has grown alongside his research. Willem has published multiple papers on conservation management, highlighting the importance of human land management on ecosystem protection. One of these papers included his thesis from Vrije Universiteit's Institute for Environmental Studies, "Managing Our Land for Multiple Ecosystem Services: Identifying Priority Areas and Actions to Maintain Ecosystem Services Across Europe."

Since finishing his dissertation, Willem worked with the Netherlands Environmental Assessment Agency (PBL) to study the global impacts of land degradation on humans and ecosystem services and opportunities for restoration. At PBL, Willem expanded his modeling abilities by working with the IMAGE-model, a global integrated assessment model.

Willem brings extensive knowledge on human interactions with land biodiversity and agriculture to the Pardee Center. His experience facilitates his desire to connect quantitative analyses of sustainability to understandable policy. Willem hopes his work at the Pardee Center will encourage effective policies toward environmental and human sustainability. He also looks forward to exploring more of Colorado through hiking.

—CAROLE GREEN

YUTANG XIONG

Yutang Xiong joined the Pardee Center in May 2018 as a Research Aide supporting data management across a range of projects and initiatives. He soon became his team's Project Lead and later transitioned to a full-time staff member role. He attributes this trajectory, from team member to Data Operations Manager, to his success leading the Pardee Center's International Futures (IFs) Data Team, which is central to the continuous maintenance and expansion of the IFs model and, by extension, the Pardee Center's research portfolio.

Colleagues note an appreciation for Yutang's incredible attention to detail, unique ability to understand how different data elements relate to one another and to various functions within IFs, and for his keen awareness of Denver's best restaurants. His team echoes this, expressing gratitude for how he so generously shares his skills and knowledge while facilitating a positive team culture through a truly collaborative form of leadership—and no shortage of treats and recipes from his home in Jiangxi Province, China! Yutang emphasizes that in addition to being engaged, curious, and talented users of the IFs system, the IFs Data Team members have formed meaningful friendships outside of their work. Indeed, the IFs Data Team has hosted international themed dinners, organized camping trips, and made great efforts to ensure their workspace, endearingly referred to as the IFs Data Den, is a place where all team members feel welcome to spend time together between classes.

Yutang is himself pursuing a PhD in Research Methods and Statistics from the University of Denver's Morgridge College of Education and knows how challenging it can be to balance academic commitments with professional goals. He believes that particularly stressful periods (like during final exams) are made less difficult due to the mutual respect the team has built and the willingness of team members to support each other's work. The Center appreciates Yutang's ability to maintain a rigorous team agenda while building a sense of community that continues to thrive and support its members during a time when community has become so important.

— WHITNEY DORAN

Bentley-Moyer Family Update

On December 19, 2019, Gayle Bentley and Jonathan Moyer were engaged and wed at a small ceremony with their son Elias Moyer, two dogs (Chloe and Friendship), and their Mennonite pastor. They look forward to a long life of traveling, sharing ideas, and caring for one another. Since their marriage the couple have expanded their family by adding five chickens (names to be determined).

Gayle and Jonathan thank the Pardee Center community for its friendship and support as they start their married lives together.

—CAROLE GREEN

Staff & Research Aide Awards 2019-2020

Each year at the Pardee Center's End of Year Celebration, our community comes together to acknowledge the outstanding contributions of Research Aides and staff. As part of this ceremony, awards are presented to those who through a particular effort in the previous year or consistent engagement across time have embodied the mission and values of the Center in ways that their peers believe merit unique recognition. For the 2019-2020 year, the Center recognized the Pardee Center's Assistant Director of Research Operations Mickey Rafa, Research Associate Taylor Hanna, and Research Aide and Country and Organization Leader Travel (COLT) Team Project Lead Marianne Hughes.

Mickey joined the Pardee Center in December 2011 as a graduate student at the Korbel School and has been a cornerstone of the Center's research since. In addition to overseeing a robust grants, contracts, and reporting structure that ensures the financial viability of our work as a soft-money research center, he also contributes substantively to the research portfolio he helps to develop. Over the past two years, Mickey has led efforts that have created policy-oriented research in partnership with USAID and UK aid agencies, has produced co-authored peer-reviewed work, and is crucial to our continued expansion into work related to the future of sub-national development around the world. Mickey truly embodies the Center's values and brings great integrity and an ever-gracious demeanor to his work with colleagues.

Taylor began working with the Pardee Center as a graduate student Research Aide in August 2016. Upon graduation, she served as a Research Fellow and later transitioned into the role of a full-time Research Associate. Throughout her time at the Pardee Center, Taylor has contributed to and frequently led some of the Center's most impactful research. Taylor has co-authored work for the United Nations Development Programme for the governments of Brazil, Egypt, Moldova, and North Macedonia. She also was instrumental in developing the Center's two UNDP Yemen reports exploring the effects of conflict on development in the region, which were broadly featured in the media and quoted on the floor of the U.S. Senate. Taylor also serves as the Literature Review Team Lead and is an incredible mentor who creatively and generously shares her knowledge of the International Futures system and qualitative research methods.

Marianne began working with the Pardee Center in January 2017. Since then, Marianne has advanced from her undergraduate studies at the University to a master's program at the Korbel School and has moved from COLT Project team member to COLT Project Lead. Data created as part of the COLT Project are widely used in the U.S. government, informing policy analysis across a range of organizations, and are an essential component of the Center's groundbreaking Diplometrics Program. Marianne has helped to create new ways of gathering, evaluating, and vetting data, while managing a large team of student researchers. She leads with integrity and has worked to create a positive work culture amongst her team. We are so pleased that Marianne is a member of our research community.

—CAROLE GREEN

MICKEY RAFA

TAYLOR HANNA

MARIANNE HUGHES

Pardee in the World: Presentations, Conferences, Meetings, & Events

AUGUST 2019

- Brian O'Neill participated in the Third Lead Author Meeting of the Intergovernmental Panel on Climate Change Working Group – Toulouse, France

- Austin Matthews shared research developed in collaboration with Jonathan Moyer, David Bohl, and Collin Meisel in a presentation titled "Intergovernmental Organizations: Forecasting Dyadic Membership" at the American Political Science Association Conference – Washington, D.C.

SEPTEMBER 2019

- Brian O'Neill attended the Max Planck Society Symposium on Geoanthropology career conference to connect with researchers – Berlin, Germany

- Jonathan Moyer, with Taylor Hanna and David Bohl, presented on sustainable development in Yemen to launch the report titled "The Impact of War on Development: The Case of Yemen" in partnership with the United Nations Development Programme – New York, New York

OCTOBER 2019

- David Bohl presented on International Futures at the What Works Global Summit 2019 – Mexico City, Mexico

- Brian O'Neill participated in a Scoping Meeting for the IPCC Synthesis Report – Singapore

- Jonathan Moyer presented "In What Context Is Head-of-State Travel a Leading Indicator of Trade? Introducing the Head-of-State/Government (HOGS) Data Project" at the Korbel Research Seminar – Denver, Colorado

- Austin Matthews and Collin Meisel shared Diplometrics research in a presentation titled "How to Win and Lose in a New Era of Mass Migration" at the Joint Annual Meeting of the International Security Studies Section of the International Studies Association and the International Security and Arms Control Section of the American Political Science Association – Denver, Colorado

NOVEMBER 2019

- Brian O'Neill attended the Joint Global Change Research Institute Community Modeling Meeting – College Park, Maryland

- Brian O'Neill, as a member of its Scientific Steering Committee, participated in an Analysis, Integration, and Modeling of Earth System (AIMES) workshop – Manaus, Brazil

DECEMBER 2019

- Barry Hughes, Brian O'Neill, and Dale Rothman each presented at the Annual Meeting of the Integrated Assessment Modeling Consortium on "Pursuing the SDGs: Integrated Scenario Analysis," "Achievements and Needs for the Climate Change Scenarios Framework," and "The Strategic Role of Carbon Dioxide Removal and Solar Geoengineering under Alternative World Futures," respectively – Tsukuba, Japan

- Jonathan Moyer presented at the Center for Strategic and International Studies and USAID on the UNDP Yemen report titled "Assessing the Impacts of War" – Washington, D.C.

- Jonathan Moyer met with the UNDP Programme Administrator to discuss development data, planning, and tools as well as opportunities for collaboration in Yemen toward peace, stabilization, and recovery – New York, New York

- Jonathan Moyer presented in a meeting on forecasting with the United Nations Department of Political and Peacebuilding Affairs – New York, New York

- Jonathan Moyer presented at the keystone session of the Alexandria Dialogues sponsored by the United Nations and the Government of Egypt – Alexandria, Egypt

JANUARY 2020

- Brian O'Neill participated in a Lead Author Working Group Meeting for the Intergovernmental Panel on Climate Change – Faro, Portugal

FEBRUARY 2020

- David Bohl, Abigail Kabandula, and Jonathan Moyer presented at the African Union Heads of State Summit 2020 to launch the "Conditions for Success in the Implementation of the African Continental Free Trade Agreement" report under the Pardee Center's partnership with the African Union Development Agency's New Partnership for Africa's Development (AUDA-NEPAD) – Addis Ababa, Ethiopia

- Jonathan Moyer presented on "Measuring and Modeling the Rise of China" at the Center for U.S.-China Cooperation in partnership with the Pardee Center – Denver, Colorado

MARCH 2020

- Jonathan Moyer met with the National Intelligence Council on the Global Trends project – Virtual

- Jonathan Moyer presented in the "SDG Integration Community of Practice (CoP) Chat Webinar" hosted by the United Nations – Virtual

JUNE 2020

- The Pardee Center launched its Five-Year Strategic Plan: 2020–2025 – Denver, Colorado

- Jonathan Moyer presented in the launch of the report "Exploring the Impact of COVID19 on Africa," an Institute for Security Studies, Gordon Institute of Business Science, and Pardee Center Collaboration – Virtual

- Pardee Center staff participated in a webinar titled "How Will COVID-19 Change Africa?" hosted by the Institute for Security Studies – Virtual

JULY 2020

- David Bohl, Keith Gehring, Jonathan Moyer, and Vivian Yang provided the Pardee Center's inaugural IFs virtual training focused on the macroeconomic impacts of COVID-19 to 118 participants representing 46 UNDP country offices – Virtual

Publications 2019-2020

Data-Driven Spatial Modeling of Global Long-Term Urban Land Development: The SELECT Model
By: Jing Gao and Brian C. O'Neill
Environmental Modelling & Software, September 2019
This paper developed the Spatially-Explicit, Long-term, Empirical City (SELECT) development model to project urban land-use.

Empirically Based Spatial Projections of U.S. Population Age Structure Consistent with the Shared Socioeconomic Pathways
By: Erich Striessnig, Jing Gao, Brian C. O'Neill, and Leiwen Jiang
Environmental Research Letters, November 2019
This paper projected age structures in various regions of the U.S. based on Shared Socioeconomic Pathways. The paper highlights the potential of forecasting regional age structures in other countries as well.

Are We on the Right Path to Achieve the Sustainable Development Goals?
By: Jonathan D. Moyer and Steve Hedden
World Development, March 2020
This paper analyzed the likelihood of reaching the Sustainable Development Goals by using Shared Socioeconomic Pathway 2 and the International Futures model to look at human development.

The Effects of Education on Determinants of Climate Change Risk
By: Brian C. O'Neill, Leiwen Jiang, Samir KC, Regina Fuchs, Shonali Pachauri, Emily K. Laidlaw, Tiantian Zhang, Wei Zhou, and Xiaolin Ren
Nature Sustainability, April 2020
The connection between education and climate change is explored in this paper through modeling the global economy, education in populations, emissions, and vulnerability.

U.S. State-Level Projections of the Spatial Distribution of Population Consistent with Shared Socioeconomic Pathways
By: Hamidreza Zoraghein and Brian C. O'Neill
Sustainability, April 2020
This paper created gridded population projections for the U.S. in line with the state-level projections based on the Shared Socioeconomic Pathways.

Mapping Global Urban Land for the 21st Century with Data-Driven Simulations and Shared Socioeconomic Pathways
By: Jing Gao and Brian C. O'Neill
Nature Communications, May 2020
This article produces a set of global gridded projections of urban land, using Shared Socioeconomic Pathways to model urbanization globally.

The Persistent Global Burden of Severe Acute Malnutrition: Cross-Country Estimates, Models, and Forecasts
By: Jonathan D. Moyer, David K. Bohl, Caleb Petry, Andrew Scott, José R. Solórzano, and Randall Kuhn
Global Transitions, July 2020
This article explores the future of severe acute malnutrition, a leading cause of childhood disease and death. It found that forecasts of future prevalence are most sensitive to uncertainty associated with the future of internal conflict.

What Are the Drivers of Diplomacy? Introducing and Testing New Annual Dyadic Data Measuring Diplomatic Exchange
By: Jonathan D. Moyer, Sarah D. Turner, and Collin J. Meisel
Journal of Peace Research, July 2020
This research note introduces the diplomatic representation data set produced by the Diplometrics Program and illustrates how this dataset serves as an important resource for advancing the field.

Central America and the Caribbean Regional Education Report

By: Sarah Dickerson, David K. Bohl, Barry B. Hughes, Mohammod Irfan, Jonathan D. Moyer, Kanishka Naryan, Alex Porter, Andrew Scott, and José Solórzano

USAID, August 2019

This report highlighted the impacts of investing in education in Central America and the Caribbean by analyzing the relationship between education and economic activity, social violence, and migration. Increased education was seen to have positive impacts on all areas explored. Some countries, such as Haiti, Guatemala, and Honduras, see especially high increases from starting at a low base.

The Future of the Guatemalan Education System: A Macro Analysis of Education Quality and Quantity's Impact on Development

By: Alex Porter, David K. Bohl, Sarah Dickerson, Barry B. Hughes, Mohammod Irfan, Jonathan D. Moyer, Kanishka Naryan, Andrew Scott, and José Solórzano

USAID, August 2019

This report used the same methods as were used in the broader Central America and Caribbean study to analyze the impacts of increased education in Guatemala. As with the broader regional study, Guatemala was seen to improve economically, decrease in social violence, and decrease in migration if education levels were raised.

The Future of the Honduran Education System: A Macro Analysis of Education Quality and Quantity's Impact on Development

By: Alex Porter, David K. Bohl, Sarah Dickerson, Barry B. Hughes, Mohammod Irfan, Jonathan D. Moyer, Kanishka Naryan, Andrew Scott, and José Solórzano

USAID, August 2019

This report used the same methods as were used in the broader Central America and Caribbean study to analyze the impacts of increased education in Honduras. As with the broader regional study, Honduras was seen to improve economically, decrease in social violence, and decrease in migration if education levels were raised.

Assessing the Impact of War in Yemen on Achieving the Sustainable Development Goals

By: Jonathan D. Moyer, Taylor Hanna, David K. Bohl, and Brendan R. Mapes

United Nations Development Programme, September 2019

This is the second of two Pardee Center reports commissioned by the UNDP on the impact of the civil war in Yemen. The analysis focused on the impact of the civil war on progress toward the Sustainable Development Goals compared to the greater progress if the conflict were to end.

Conditions for Success in the Implementation of the African Continental Free Trade Agreement

By: Abigail Kabandula, David K. Bohl, Jonathan D. Moyer, Taylor Hanna, Barry B. Hughes, Yutang Xiong, and Collin J. Meisel

African Union Development Agency (AUDA-NEPAD), February 2020

This report utilized the International Futures modeling system to analyze the impact of the African Continental Free Trade Agreement on the African economy. It found that "lowering intra-African trade tariffs can produce significant long-term economic gains."

Impact of COVID-19 in Africa: A Scenario Analysis to 2030

By: Jakkie Cilliers, Marius Oosthuizen, Stellah Kwasi, Kelly Alexander, T.K. Pooe, Kouassi Yeboua, and Jonathan D. Moyer

Institute for Security Studies, July 2020

Three different futures were forecast for Africa as relates to the coronavirus pandemic. The futures were analyzed around per capita income, poverty and the attainment of selected Sustainable Development Goal targets.

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

This Pardee Center report, currently in final draft stages, is based on a collaborative study with the Overseas Development Institute. It assesses long-term poverty in Zambia across a Current Path trajectory and a variety of alternative scenarios.

Does China Have the Most Diplomatic Pull on the Planet?

By: Collin J. Meisel, Whitney Doran, Caroline Plante, and Marianne Hughes
The Hill, December 2019
In this opinion piece, the authors examined China's diplomatic power by using the growing Country and Organization Leader Dataset (COLT).

COVID-19 is Accelerating the Power Transition Between the U.S. and China

By: Collin J. Meisel and Jonathan D. Moyer
Duck of Minerva, May 2020
This post highlights the impacts of COVID-19 on power relations between the U.S. and China. The authors use the International Futures model to forecast the impact of the virus on global power index levels, GDP, and population of both countries.

Which Development Targets are Hardest Hit by COVID-19?

By: Whitney Doran and Jonathan D. Moyer
UNDP's Sustainable Development Goals Integration Office, July 2020
This piece discusses the variation in impacts from the coronavirus pandemic on the Sustainable Development Goals. The authors also highlight the range of work being done by the Pardee Center around COVID-19 socioeconomic impacts.

Will the Coronavirus Fuel Conflict?

By: Jonathan D. Moyer and Oliver Kaplan
Foreign Policy, July 2020
Using data and forecasts from the Minerva grant project, Moyer and Kaplan look into how COVID-19 impacts state fragility. The authors point out that several countries are more likely to face potential wars or civil conflicts due to the virus.

BOOKS AND BOOK CHAPTERS

Climate Scenarios and Their Relevance and Implications for Impact Studies

By: Claudia Tebaldi and Brian C. O'Neill
Chapter in *Climate Extremes and Their Implications for Impact and Risk Assessment,* Elsevier, January 2020
This book chapter highlights how Shared Socioeconomic Pathways are used for climate change impact studies.

The International Political Economy of Human Security in Africa

By: Abigail Kabandula
Chapter in *The Routledge Handbook to Global Political Economy,* Routledge, April 2020
This book chapter explores the application of international political economy theories and human security concepts to Africa.

Rising Powers and the Horn of Africa: Conflicting Regionalisms

By: Abigail Kabandula and Timothy Shaw
Chapter in *Rising Powers in International Conflict Management: Converging and Contesting Approaches,* Routledge, May 2020
The chapter explores non-traditional security in the Horn of Africa and argues that while rising powers (Turkey and the Gulf States) play important roles in development in Africa, their recent political engagement and regional expansion have contributed to the fragility of the region, making it susceptible to both intra- and inter-state conflicts.

CONFERENCE PAPERS AND ABSTRACTS

Global Spatial Urban Expansion Scenarios Consistent with the Shared Socioeconomic Pathways (SSPs)

By Jing Gao and Brian C. O'Neill
American Geophysical Union Fall Meeting, December 2019
This abstract continues the focus by Gao and O'Neill on urbanization forecasts to highlight the quantitative projections created in line with Shared Socioeconomic Pathways.

Research and Collaboration at the Korbel School

The 2019-2020 academic year was one of both reflection and looking forward for the Pardee Center as it entered its five-year strategic planning process. This may also be said of the Pardee Center's home institution, the University of Denver's Josef Korbel School for International Studies. During this time, the Korbel School welcomed Frederick "Fritz" Mayer as its new Dean, introduced strategic initiatives to strengthen the School's research endeavors, and notably bolstered its undergraduate and graduate student recruitment efforts—in fact, the School is positioned to welcome this fall the largest cohort of Returned Peace Corps Volunteers in its 17-year partnership with Peace Corps' Paul D. Coverdell Fellows Program.

> The Center is well positioned to help students at the Korbel School to develop both quantitative and qualitative research skillsets through experiential learning [and] collaboration with research clients, and provide opportunities to learn about systems modeling ...

Dean Mayer came to the University of Denver from Duke University, where he served most recently as Associate Dean in the Terry Sanford School of Public Policy. While at Duke, he also served as Director of the Center for Political Leadership, Innovation, and Service; Director of the Duke Policy Bridge; and Director of the Program on Global Policy and Governance.

Throughout his first year at the Korbel School, Dean Mayer oversaw the development of initiatives to further support and integrate research centers with broader efforts. In October 2019, he helped to establish the Centers and Institutes Review Committee whose goal is to ensure centers at the Korbel School have the support they need to advance their work, enrich the student experience, and engage with our communities.

In July 2020, these efforts resulted in leadership transitions and appointments within many of the School's major centers and institutes. In the coming year, the Pardee Center, represented by Director Jonathan Moyer, will meet regularly with Directors from other research centers at the Korbel School as part of a new Research Council. The newly established Research Council will be chaired by the Associate Dean for Faculty and Research and its mission will be to coordinate the School's research efforts, to maximize potential synergies, and to align Korbel research with the strategic priorities of the School.

These developments contribute directly to the Pardee Center's strategic goal to increase engagement with the Korbel School for enhanced research, greater community, and quality student learning and development. Dean Mayer is enthusiastic about the Center's strategic initiatives and is eager to support projects that unite the Center's applied research strengths with the expertise of Korbel faculty. Additionally, he believes the Center is well positioned to help students at the Korbel School to develop both quantitative and qualitative research skillsets through experiential learning, develop professionally through direct collaboration with research clients, and to learn about systems modeling through graduate and undergraduate coursework focused on the International Futures model.

— MELISSA SHAMBACH

INTERNATIONAL FUTURES REMOTE COURSEWORK

The International Futures (IFs) system was originally developed by Pardee Center founder Barry Hughes as a freely available educational tool for university students and has since grown to inform professional policy analysts in their efforts to think about the future. Since its beginning, the Pardee Center has remained committed to ensuring that the tool remains free and open to the public, including through formal coursework in the Korbel School and trainings to teach students and the broader IFs community how to use IFs for research, forecasting, and policy analysis.

In response to the COVID-19 pandemic as well as the University of Denver's broader efforts to incorporate online components into curricula, Pardee Center staff and partners have moved Korbel School IFs classes to an online format and created video modules that made IFs education more accessible. Pardee Center Director Jonathan Moyer piloted the graduate level remote IFs course in Spring 2020 and Pardee Center Faculty Affiliate Keith Gehring is piloting the undergraduate IFs course in its new format in Fall 2020. Both courses may be converted to a hybrid-class format (in-person and online) in future years to further expand the Center's IFs user base.

Professor Gehring played a special role in the conceptualization and production of the virtual course, including video components focused on issue areas. As a Teaching Associate Professor in the Korbel School, Keith instructs and mentors undergraduate students using his expertise in political economics, technology, and forecasting. He has been associated with the Pardee Center in a variety of ways since its earliest days. Currently, his work with undergraduate students not only furthers the use of IFs, but also connects the efforts of the Korbel School with those of the Pardee Center to encourage effective education and policy. The Pardee Center is grateful for our ongoing relationship with Keith and for his commitment to furthering research and undergraduate student education.

— CAROLE GREEN