Predicting Climate Policy Choices: The Indian Water Mission

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Introduction: Harald Fuhr and Climate Change

Harald Fuhr arrived to the University of Potsdam from the World Bank, steeped in perspectives of international public administration from the academic and the practical side alike – and thereby offered the Department of Political Science and Public Administration much appreciated complementary strengths far beyond the international relations field that he was charged to cover in its entirety. Given that various research institutes in Potsdam and Berlin have much to offer on environmental and especially climate policy research, Harald dedicated a substantial part of his research, teaching, publications, and mentoring to the climate policy field besides becoming one of the main promotors and later chairman of a doctoral training group on wicked problems – which naturally included the vexing issue of climate change at various levels of governance and a variety of regions. His contributions to the academic literature on climate policy focused on developing countries and emerging economies, the role of cities, public administrations, and sub-national as well as transnational processes (Fuhr/Lederer 2009; Fuhr et al. 2018; Hickmann et al. 2017; Fuhr et al. 2017; Fuhr/Hickmann 2016). Given Harald's long-standing interests, our chapter will consist of climate policy questions at the subnational level in a pivotal emerging economy, India, a country that is likely to become the most populous country on planet Earth. The topic is ultimately about predicting the outcomes of policy negotiations, and Harald was a canny and very successful negotiator himself.

India belongs to the core players of the international climate regime. Following the 2015 Paris Agreement on climate change, an international treaty mandated to chart the way for decades to come, the Paris Agreement essentially man-

dates countries to do their best to mitigate greenhouse gases, adapt where necessary, and consider the role of loss and damage where the first two strategies fall short. This bottom-up architecture is meant to limit global climate change to 1.5–2°C change in global mean temperature as compared to the pre-industrial period, and given that such a goal is difficult to achieve, countries are mandated to submit every five years ever more ambitious new national climate plans. This bottom-up architecture is complemented at the international level by providing a focal point of the overall goal (see above), monitoring, review, and verification as well as channeling international flows of climate finance.

With a view on bottom-up architectures, it matters whether and how India, a pivotal global actor of climate change, implements national climate policies. In this contribution, we focus on the Indian National Water Mission and predict the outcomes on two issues: First, whether river basins will be interlinked, and second, whether the public-private partnership model will be employed or rejected in the management of water issues. Employing the Predictioneer's Game, we foresee that the Central government does not succeed in interlinking all river basins and that the public-private partnership model is strongly opposed. Regardless of robustness checks, the central findings are that the Central Government will use its veto. We expect that the two issues examined will continue to witness political conflict in the future.

In the following, we will provide a brief overview of India in global climate policy, introduce the policy negotiation forecasting tool, the Predictioneer's Game, and the issues chosen, present the analyses, and offer concluding remarks.

India in Global Climate Policy

In this chapter we explore the applicability of the approach of repeated games to understand the evolution of policy in the Indian context, given the peculiarities of the Indian democracy. Given its stature as the fourth largest emitter of greenhouse gases, India's ascent to the 2015 Paris Agreement on Climate Change was pivotal. This is also reflected by India's role as a member in two crucial climate negotiation groups, namely BRICS (Brazil, Russia, India, China, and South Africa) and BASIC (Brazil, South Africa, India, and China), which are co-shaping global strategies to cope with climate change (Isoaho et al. 2016). India articulated its position particularly with respect to Common But Differentiated Responsibilities in Paris and committed to a reduction in the emissions intensity of its GDP by 33–35 % until 2030 from 2005 levels. It also volunteered to create an additional carbon sink of 2.5 to 3 billion tons of CO_2 equivalent through additional forest and tree cover by 2030 (UNFCCC 2016). Given its population size and rapidly growing economy, India's actions and non-actions matter at the global level for climate change outcomes. In this contribution, we undertake predic-

tions in the water sector to elucidate potential policy developments within a climate-relevant sector.

In 2007, the Government of India set up the Prime Minister's Advisory Council on Climate Change to aid in the preparation of its policy positions and its response(s) to climate change. Various national level ministerial consultations and domestic climate change assessment studies resulted in the formation of the National Action Plan on Climate Change (NAPCC) in June 2008, revised in later years. The NAPCC charts eight missions - Solar Mission, Enhanced Energy Efficiency, Sustainable Habitat, Water Mission, Sustaining the Himalayan Ecosystem, "Green India", Sustainable Agriculture, and Strategic Knowledge for Climate Change, along with ongoing initiatives on Power Generation, Renewable Energy and Energy Efficiency, implemented and monitored by the respective ministries (Byrvan/Rajan 2012; Ministry of Environment and Forest 2008; Ravindranath/Murthy 2010). The NAPCC directed the Indian states to come up with their own State Action Plans on Climate Change (Ministry of Environment and Forest 2008), and these missions were estimated to cost the Government of India approximately Rs. 2.3tr (Pahuja et al. 2014) in the Twelfth Five-Year Plan (2012–2017) alone.

The Indian government has increasingly focused on river-interlinking projects across the country to combat floods and drought. This high-investment project also faces stiff opposition from a few states and the public. With the first Modi government's election promise to alleviate the water crisis in the country and the reality of climate change drastically altering the monsoon patterns in most of the country, the National Water Mission under the Climate Action Plans has become the most debated and researched climate mission.

Among the goals to be achieved, the National Water Mission mentions the need for "conservation by reducing evaporation" at an estimated cost of Rs. 5b (Ministry of Water Resources 2009). Neither the methodology of execution nor of funding of the activity is detailed. Thus, it is apparent that what eventually will be funded and implemented depends on the negotiations between the stakeholders at different levels of governance and non-governmental players.

Similarly, the mission document does not address the influence of already existing practices – formal as well as informal – in water resource management such as water markets at local village levels (Manjunatha et al. 2011; Varughese 2012), the impact of water pricing, or the consequences of river interlinking projects that could threaten the very river basin (Iyer 2012).

Policy prediction as a tool can bridge the gap between environmental experts and decision makers, with helpful inputs from experts for stakeholder consultations on critical environmental matters. Ideally, prediction models can assist policy agreement among all parties and advance policy decision making in an equitable and inclusive manner.

Our prediction exercise allows us to look beyond the immediate political compulsions that drive policy-making in any democracy – the need for the political

executive to keep its voters and supporters satisfied. It allows us to also look at the perspective of non-political stake-holders who are necessarily involved; consequently, it allows us to understand the nuances and intricacies of the interplay and their impact on the policy outcome.

A prediction is, hence, not an end in itself, but a starting step - enabling an analysis of factors that engender the responses and how to minimize or circumvent critical blocks. This contribution draws attention to the opportunities available to employ analytical tools for informed policy making. Regarding this effect we will undertake predictions germane to the National Water Mission.

Predicting the Outcomes of India's Water Mission

Data Inputs

Employing non-cooperative game theory for predicting complex social science negotiations has emerged over the past three decades (e.g., Finus 2000; Hermans et al. 2014), yet is still an under-appreciated tool to systematically map a fixed set of characteristics (or input dimensions) of each stakeholder (or actor) in the context of a simulation model to outcomes. We chose the Predictioneer's Game (for a more detailed introduction, see Bueno de Mesquita 2011; 2009; Sprinz et al. 2016; Sprinz/Bueno de Mesquita 2015) because of its long track record in the published literature and its accessibility for research purposes. It assumes that each issue is negotiated on its own merits (rather than linked to others).

The Predictioneer's Game model requires the following inputs:

- specification of the stakeholders (or actors), both actual as well as potential,
- potential influence (irrespective of the particular issue under consideration),
- position of the stakeholder on a uni-dimensional issue scale,
- salience of the particular issue under consideration to the stakeholder,
- flexibility or resolve of the stakeholder, and
- formal veto power (present or not).

The model itself computes the set of all round-by-round bilateral negotiations between all stakeholders under incomplete information. The game employs Bayesian updating and computes round-by-round negotiation results via the mean voter theorem (Bueno de Mesquita 2011; 2009; Sprinz et al. 2016). The game ends when the average player expects negative utility from proceeding to the next round or if a veto player expects this to happen. The model and its predecessor have been assessed to be correct 90 % of the times and have been used for predicting foreign policy decision-making as well as the outcomes of global climate change negotiations (ibid.).

For our predictions, a list of the stakeholders was established after reviewing the National Water Mission, Moe's official publications on water resources, and inputs from personal communication with experts from water resource management, academia, activists, etc. Structured interviews were carried out through target and later respondent-driven sampling.

The central inputs of the Predictioneer's Game comprise the following inputs for each stakeholder:

- *Potential Influence:* a metric of each player's general capacity to persuade others to take their position. The values range from "0" (for those who have no influence over others) to "100" (for those who exert maximum influence).
- *Policy Position:* Representation of an actors preferred position on a pre-determined scale. The scale is single-peaked and monotonic. We reprint the position scales for each of the issues in Appendix 1.
- *Salience:* a metric of the importance of the issue to the stakeholders; it ranges from "0" (zero importance) to "100 " (single-most important issue that requires dropping all other issues).
- *Flexibility/Resolve:* This scale represents the balance between sticking to one's position, ranging from "0" (holding on to one's position no matter what) to "100" (abandoning one's position in order to achieve an agreement), with "50" weighing each aspect equally.
- *Formal Veto:* The formal capacity of a particular player to enforce the status quo ante following the conclusion of negotiations.

The inputs to the model are generated by (a) collecting data on the published positions of stakeholders, (b) interviewing experts in the field for their informed perceptions on the positions and influence of the stakeholders through structured personal interviews, and (c) by structured interviews with individual as well as group stake-holders at the ground level. The data was collected from January 2014 for the water mission. The issues were further refined and discussions with experts were subsequently held. The data was collected from several levels and from several states. Scores were assigned based on careful evaluation of documented responsibilities, recent years of media documentation on various issues, and the literature on resource management in India.

To assure ourselves that the model would actually yield results in the Indian context, we ran *ex post facto post-dictive* analyses of two historical issues: Coca Cola versus The People of Plachimada, Kerala, in 2002 (Bijoy 2006), and the Joint Forest Management (JFM) project in Andhra Pradesh (Reddy et al. 2019; Saito-Jensen 2008, 04; Saito-Jensen/Jensen 2010). The outcome of the model runs is comparable with the actual outcomes of the negotiations despite the fact that some stake-holders/players who were included in our analysis did not find mention in the literature on actual negotiations. This gives us confidence that the Predictioneer's Game would be a good choice for predicting climate change pol-

icies of India and that it is reasonably robust in its application to the Indian context (Shreejaya et al. 2014).

After analyzing the initial data gathered we chose the following two issues as being best suited for analysis using the Predictioneer's Game as these provided model outcomes that could easily be tested against reality and were naturally amenable to numerical calibration. We concentrated on the following issues of the National Water Mission, based on the Modi I government's focus as well as ease of applying the model with numerical parameters based on available sources:

> *Issue 1:* Interlinking of Rivers: The Outcome is scored between "0" to "320" as follows:
> "0" means no inter-linking of rivers takes place;
> "320" represents the scale point that all target rivers are interlinked.
>
> *The data was originally collected from January 2014 until March 2014 and the issue was revisited in August 2015.*
>
> *Issue 2:* Public-Private Partnerships (PPP) in Managing Water: The outcome is scored between "0" and "100" as follows:
> "0" represents a stance opposing PPP models;
> "100" represents wholeheartedly in favor of the PPP model for water efficiency and technology.
>
> *The data was collected from January 2014 to May 2014.*

We reprint the detailed position scales in Appendix 1. The positions for each of the players have to fall in between the minimum and maximum on the position scales. The list of stakeholders, their potential influence, positions, salience, flexibility, and formal veto power is reprinted in Appendix 2.

Analysis and Interpretation

Predicting the Interlinkage of River Basins (Issue 1)

With respect to the issue of river interlinkage, our coding indicates that 8 out of 15 actors, especially at the lower levels of government, consumers, and select other stakeholders hold very minor potential influence (score of "1" on a scale of 0 to 100) while the Ministry of Water Resources (MoWR) and the State Governments are the most influential actors. In addition, the MoWR also holds veto power over any outcomes. Our analyses suggest that the negotiations end rather quickly after just one round at a smoothed mean of 143, indicating that the ca. 12 river basins were to be connected (see Appendix 1 for detailed position scales). It is to be noted that these are negotiations on planned policies rather than on

implementation of specific plans for particular river basins. The predicted outcome substantially differs from no action or only linking tributaries.

As the negotiated outcome is too far from the position of the MoWR (i.e., 320) in negotiation round 1, it will veto the outcome (smoothed mean of 143) and the status quo ante prevails, i.e., the MoWR would like to stick to linking all 14 Himalayan and 16 peninsular rivers (i.e., 30 river basins) (Ministry of Water Resources n.d.), yet the status quo itself is no interlinking of any river basins.

Some robustness checks are in order. First, if the issue scale were coded as is until the value "90" (representing interlinkage of seven river basins) and then jumps to "100" (representing linkage of all river basins), the negotiations are equally expected to last only one round and end in linking three to four river basins with a smoothed mean of 57. Again, the MoWR would execute its veto, and the status quo ante prevails. Thus, even position scale truncation (violating the interval scale properties of the scale in substantive terms) substantively leads to the same outcome.

Second, if the potential influence of minor actors is elevated from levels of "1" to "10", the outcome is "114" after three rounds of negotiations, and if the stakeholders originally scored at a potential influence of "1" are removed (i.e., set at zero which implies that they have no potential influence whatsoever), the outcome will be "108" after five rounds of negotiations – with the MoWR exercising its rights of veto in any of these robustness checks. While the MoWR initially prefers interlinkage of all 30 river basins, it does not get its way. Should it abstain from exercising this right of veto, the negotiated outcomes will amount to interlinkage of an intermediate amount of river basins – clearly at variance with the status quo of the mandate.

Third, as the interlinkage of river basins is a long-term negotiation issue which is likely to be resumed again and again, we ran predictions for 100 rounds. The trajectory of mean negotiated outcomes will show a clear downward shift towards fewer and fewer river basins being interlinked, falling into the range of "17" to "42" after 100 rounds as indicated by the smoothed mean prediction, i.e., no more than 2 river basins are linked and often fewer.

Overall, the Predictioneer's Game predicts that very few river systems, if any, will be interlinked.

Public Private Partnerships in Water Management (Issue 2)

Our second set of predictions deals with the degree of use of a PPP in water management. As for the previous issue, the negotiations end already after only one round at the level of 19, i.e., strongly opposing the PPP model, yet not approaching maximum opposition. The Planning Commission (Planning Commission of the Government of India 2011) (now NITI Aayog) is expected to use its right of veto, thus the status quo prevails.

As for the previous issue, a couple of actors were elevated from a potential influence score of "1" to "10" or excluded outright for checking the robustness of

our predictions. As for the previous issue on interlinkage of river basins, such changes of the input values of not so powerful actors do not influence the predicted outcome, yet on PPPs, a lengthening of the time horizon for on-and-off negotiations does *not* lead to a substantial change in the level of the predicted outcome. Under all three conditions for minor actors (base run, elevation, deletion), the Planning Commission will exercise its veto, leading to the status quo to continue, i.e., not introduce PPP.

In conclusion, on the issue of water management, our predictions foresee continuation of the status quo – like on the issue of interlinkage of river basins.

Discussion and Conclusions

Several aspects of the policy implementation of both issues – interlinkage of river basins and PPP for water management – are yet to be formally spelt out. Our model's predictions, however, provide expectations of likely negotiation outcomes. While there is a binding legal mandate from the Supreme Court on the inter-linking of rivers and there are reported successes in limited watersheds such as the Godavari-Krishna linkage, there appear to be serious issues that could severely limit the prospects of more interlinkages. For policy makers this would pose an obvious question: "Would India be well advised to look at alternatives to inter-basin water transfers?"

Since a few years have lapsed since the data for the predictions was collected, we are able to check the accuracy of our predictions for issue 1.

Two of the inter-linking projects – the Godvari Krishna Polavaram project and the Ken-Betwa interlinking project – have seen important developments. On 25 May 2017, the Forest Clearance for the project was granted with very strict conditions that are likely to delay the project.[1] Chief among the conditions was that the State Government needed to convert an equal amount of non-forest land to forest land and hand it over to the Forest Department so that the loss of 6,000 ha of forests due to submergence could be compensated. This would require further land acquisition - causing resettlement with associated effects on human livelihoods. Earlier, the Central Government decided that it would fund 90 % of the Rs 180 thousand crore to expedite interlinkage of these rivers.[2] Further the National Green Tribunal admitted appeals against the environmental clearance granted on 25 August 2018,[3] and this is likely to cause further delay.

In 2017, the state of Odisha moved the Supreme Court against the Polavaram project as its interests were adversely affected. The Supreme Court ordered notice

1 http://forestsclearance.nic.in/writereaddata/RO_App_Inprinciple/2605201718492016.pdf
2 https://timesofindia.indiatimes.com/india/centre-to-fund-90-of-cost-to-get-ken-betwa-linking-started/articleshow/62666856.cms
3 https://sandrp.in/2017/10/30/ngt-admits-appeal-challenging-environment-clearance-to-ken-betwa-project/

to the other parties in Aug 2018.[4] The matter is still to be decided. Meanwhile, the National Commission on Scheduled Tribes – a constitutional body mandated with the care of the Scheduled tribes – made a special report to the President of India on the status of the resettlement of the families affected by the project and has recommended several steps before the families are displaced. This is likely to delay the execution of the project as well.

In the light of the empirical evidence on issue 1, we can conclude that, building on the expert inputs, the Predictioneer's Game correctly foresaw the political and administrative contentiousness of interlinking river basins.

In infrastructure-related areas capital formation in the public sector has been hampered by budgetary constraints. Consequently, a great effort has been made to realize the potential of public private partnerships (PPP), yet there are underlying challenges and the path is not smooth. Policy makers may have to face some hard choices sooner rather than later.

Our predictions are that very few linkages of river basins will be agreed to by the different stakeholders and the MoWR will issue its veto, that is to say rivers might get linked not because stakeholders agreed to it but because they are prescribed by the federal level. Furthermore, our predictions suggest that the PPP model of water management faces dedicated opposition and is likely to be rejected. Overall, on both issues, we witness tensions between the core federal and state level actors which are likely to continue to be visible in the foreseeable future. In all likelihood, Harald Fuhr would not have been surprised by any of these findings.

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4 https://www.deccanchronicle.com/nation/current-affairs/050818/supreme-court-notice-to-andhra-pradesh-on-polavaram-project.html

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Appendix 1: Policy Position – Scales

Source: Varughese (2012), revised.

Issue 1- Linking River Basins
320- interlinking of all 30 river basins ... 140- interlinking of any 12 river basins … 50- interlinking of any 3 river basins 40- interlinking of any 2 river basins 30- interlinking of any 1 river basin 20- Tributaries within state/adjacent states linked 10- only tributaries within state are linked 0- against interlinking projects being undertaken

Issue 2- Public Private Partnerships in Water Management
100- favor PPP model for water efficiency and technology 50- neutral stance on PPP model 0 - against PPP model

Appendix 2: Data Inputs for the Predictioneer's Game

Issue 1: Linking River Basins

Group	Name	Influence	Position	Salience	Flexibility	Veto
Government	Ministry of Water Resources	100	320	80	20	1
	State Governments	80	60	60	40	0
	Panchayat	1	0	10	100	0
	NITI Aayog (PC)	40	0	30	50	0
	Ministry of Environment, Forests and Climate Change	60	10	50	30	0
	Ministry of Agriculture and Central Groundwater Board	1	20	10	80	0
	Ministry of Power	1	30	10	80	0
Consumers	Industries	1	30	20	80	0
	Farmers	1	20	10	80	0
	Citizens	1	20	1	100	0
others	Community Organizations	40	0	40	50	0
	Water Users Association	1	0	1	100	0
	Engineers	20	0	1	100	0
	Media	1	0	1	100	0
	Funding Agency	20	0	1	50	0

Issue 2: Public Private Partnerships in Water Management

Group	Name	Influence	Position	Salience	Flexibility	Veto
Government	Ministry of Water Resources	75	20	50	50	0
	State Governments	100	20	60	50	0
	NITI Aayog (PC)	50	10	10	50	1
	Ministry of Urban Development	1	10	10	70	0
	Ministry of Environment, Forests and Climate Change	50	10	30	40	0
Private sector	Industries	50	20	70	20	0
Public	Citizens	1	10	40	70	0
	Community Organizations	50	20	80	50	0
Others	Engineers	10	10	10	100	0
	Media	1	20	20	100	0
	Funding Agency	30	20	10	60	0

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