



An Agent-Based Approach for International Environmental Negotiations

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International Environmental Agreements (IEAs) on greenhouse-gases (GHG) emissions reductions have demonstrated to be extremely hard to achieve. Even after the Paris Agreement, global cooperation still may be cursed by free-riding threats and the risk of withdrawals, discouraging countries from increasing their voluntary commitment.

Several studies have already addressed the problem of agreement stability, self-enforcing strategies and coalition formation. Most of them are supported by models grounded on game theory, which account for participation rationales and address research questions about coalition-formation and optimal transfer incentives. However, diplomacy on climate change is a considerably complex problem, not exhaustively tractable by any game-theoretical framework, as it combines several deep international issues. Historical disappointments (i.e., the COP15 in Copenhagen, 2009) as well as encouraging achievements (i.e., the Paris Agreement in 2015) have also demonstrated the importance of negotiation and interaction rules in facilitating common ground for cooperation.

Here we present an attempt to reproduce and investigate IEAs on GHGs mitigation through an Agent-Based negotiating framework. It follows a bottom-up approach, based on the insights of complex systems theory, by modelling the behaviour of each region-representative negotiator. Single agents generate and update their mitigation proposals accounting for personal multi-objective evaluations over potential upcoming scenarios informed by Integrated Assessment Models projections, reactions to other participants proposals, and private negotiation strategies. Few and simple interaction rules, shared as common-knowledge, regulate the negotiation process and guarantee termination and agreement, although not imposing any minimum participation level. Several negotiations follow one another on regular time intervals, allowing all participants to rediscuss and modify their commitment.

Preliminary results point out the importance of agents multi-objective evaluations, as the potential co-benefit estimated may foster personal participation and satisfaction from the agreement achieved. The high flexibility provided by this Agent-Based approach allows to easily vary and test

several implementations and settings, searching for the best conditions to obtain cooperation as emerging behaviour in a complex yet realistic dynamic.