Perceived feasibility and potential barriers of a net-zero system transition among Japanese experts
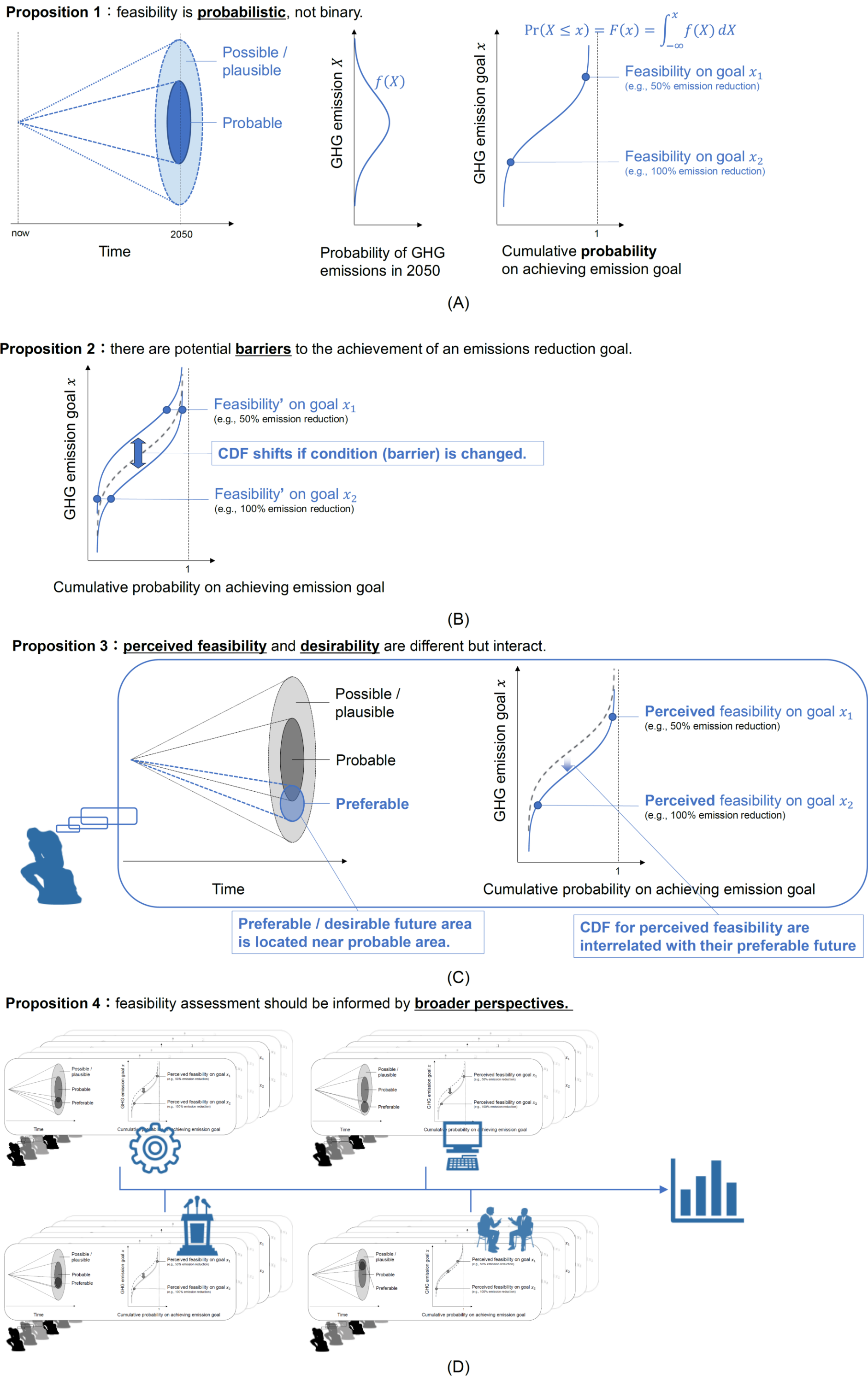
Yiyi Ju[1,2]*, Masahiro Sugiyama[2]*, Hiroto Shiraki[3]*

1 Waseda Institute for Advanced Study, Waseda University, Tokyo, Japan; 2 Institute for Future Initiatives, University of Tokyo, Tokyo, Japan; 3 Graduate School of Environmental Studies, Nagoya University, Aichi, Japan

Framework for assessing perceived feasibility of, and barriers to, deep mitigation

Proposition 1: feasibility is **probabilistic**, not binary.

$$\Pr(X \le x) = F(x) = \int_{-\infty}^{x} f(X)\, dX$$

Feasibility on goal x_1 (e.g., 50% emission reduction)

Feasibility on goal x_2 (e.g., 100% emission reduction)

(A)

Proposition 2: there are potential **barriers** to the achievement of an emissions reduction goal.

Feasibility' on goal x_1 (e.g., 50% emission reduction)

CDF shifts if condition (barrier) is changed.

Feasibility' on goal x_2 (e.g., 100% emission reduction)

(B)

Proposition 3: **perceived feasibility** and **desirability** are different but interact.

Perceived feasibility on goal x_1 (e.g., 50% emission reduction)

Perceived feasibility on goal x_2 (e.g., 100% emission reduction)

Preferable / desirable future area is located near probable area.

CDF for perceived feasibility are interrelated with their preferable future

(C)

Proposition 4: feasibility assessment should be informed by **broader perspectives.**

(D)

Proposition 1: feasibility is probabilistic, not binary, and thus, can construct a cumulative density function (CDF) of a greenhouse gas (GHG) emission goal (right, schematic CDF) A. Proposition 2: the CDF is affected by many different barriers (or soft constraints) B. Proposition 3: individual experts perceive future development of climate-related variables with large uncertainties, as illustrated by the futures cones (left), and the CDF of a GHG emission goal (i.e., perceived feasibility) for individual experts can be partially differentiated but are interrelated with their preferable future (right) C. Proposition 4: perceived feasibility is a subjective / Bayesian probability. It, as well as desirability, can be different across individuals, and thus, employing experts from broader disciplines can contribute to more contextualized feasibility assessments D.

- We found that···
- Most of the experts supported the desirability of the net-zero goal and chose a probability of 33–66% for its feasibility.
- However, the distribution of feasibility assessments differs between groups of integrated assessment modelers and authors on the IPCC report compared to more general experts, suggesting opportunities for further exploration within and between communities.
- The key barriers reflecting the unique national condition of Japan are also identified, including the limitations of national strategies and clean energy supply.

- Many governments and non-state actors have pledged to achieve net-zero greenhouse gas emissions, raising questions about the feasibility of these decarbonization goals.
- The existing literature, however, mostly relied on technoeconomic assessments and lack broad contextual considerations such as national conditions and local sociocultural characteristics.
- Here, we present a framework for assessing perceived feasibility and multi-dimensional barriers for net-zero transition that can complement existing methods of technoeconomic traditions.
- We applied this framework to the Japanese net-zero goal by surveying more than 100 experts from diverse fields with a shared national context.

We developed a survey instrument, starting from asking the desirability/feasibility of achieving carbon neutrality or deep mitigation, the previous NDC (80%), and the lower goals in Japan.

Feasibility

To what extent do you think Japan's 2050 GHG reduction goal will be feasible?
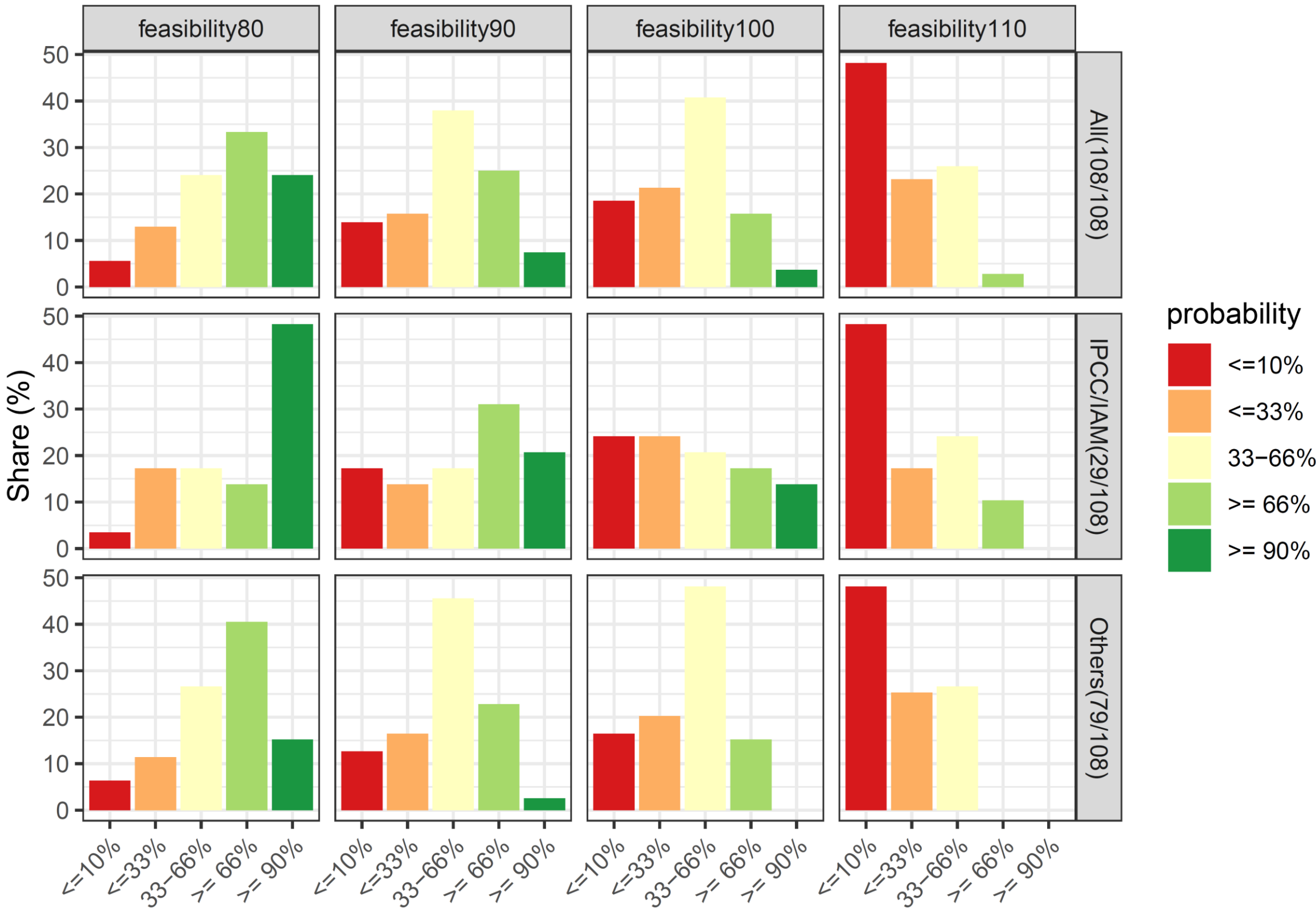
The risk of each barrier is determined by its probability (of acting as/becoming a barrier) and impact (on hindering the feasibility of achieving carbon neutrality).

Risk of all barriers
median order
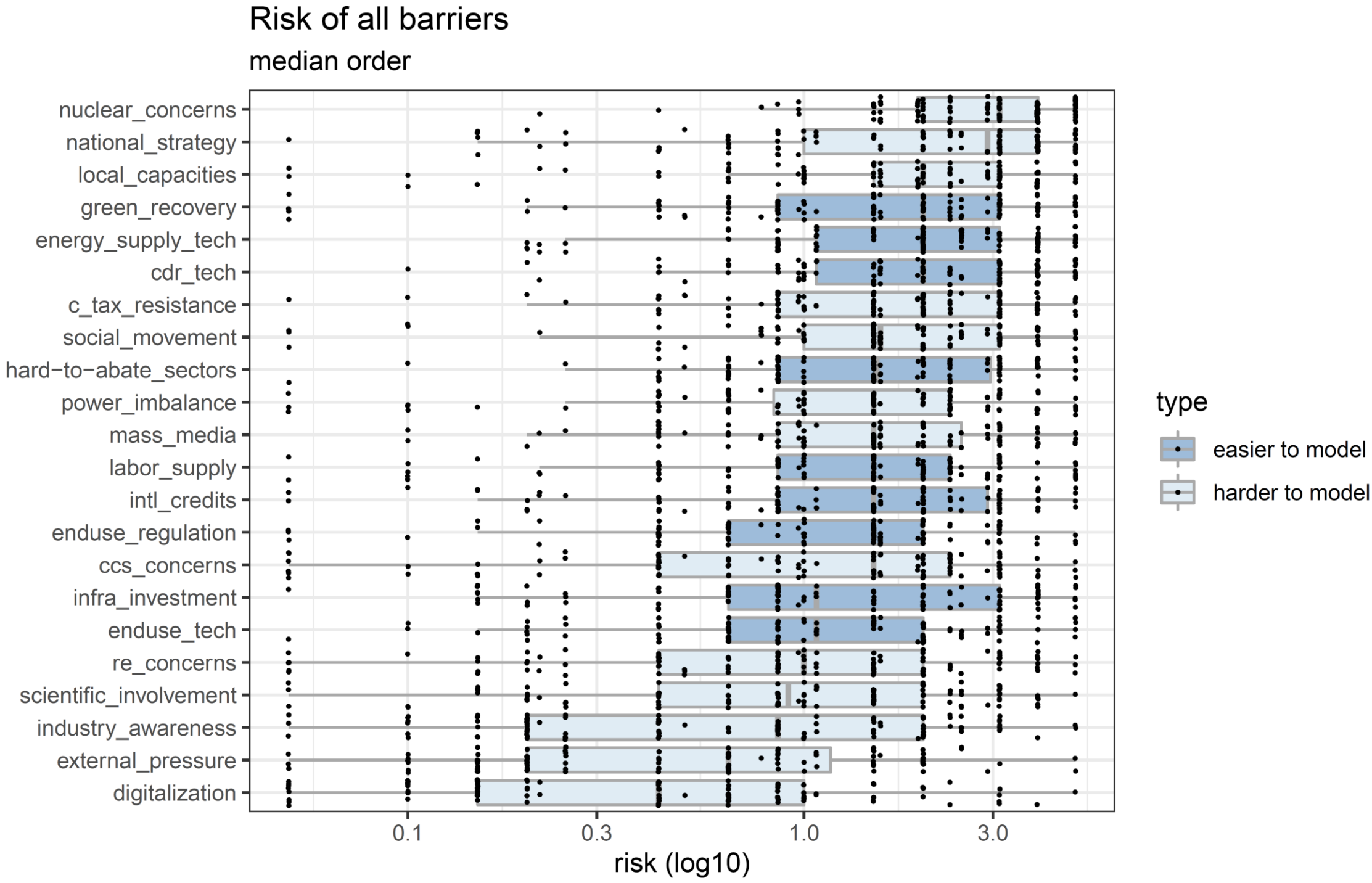
Risks of all the 22 potential barriers. Each risk is a multiplication of the perceived impact by the perceived probability.

More details please check here!