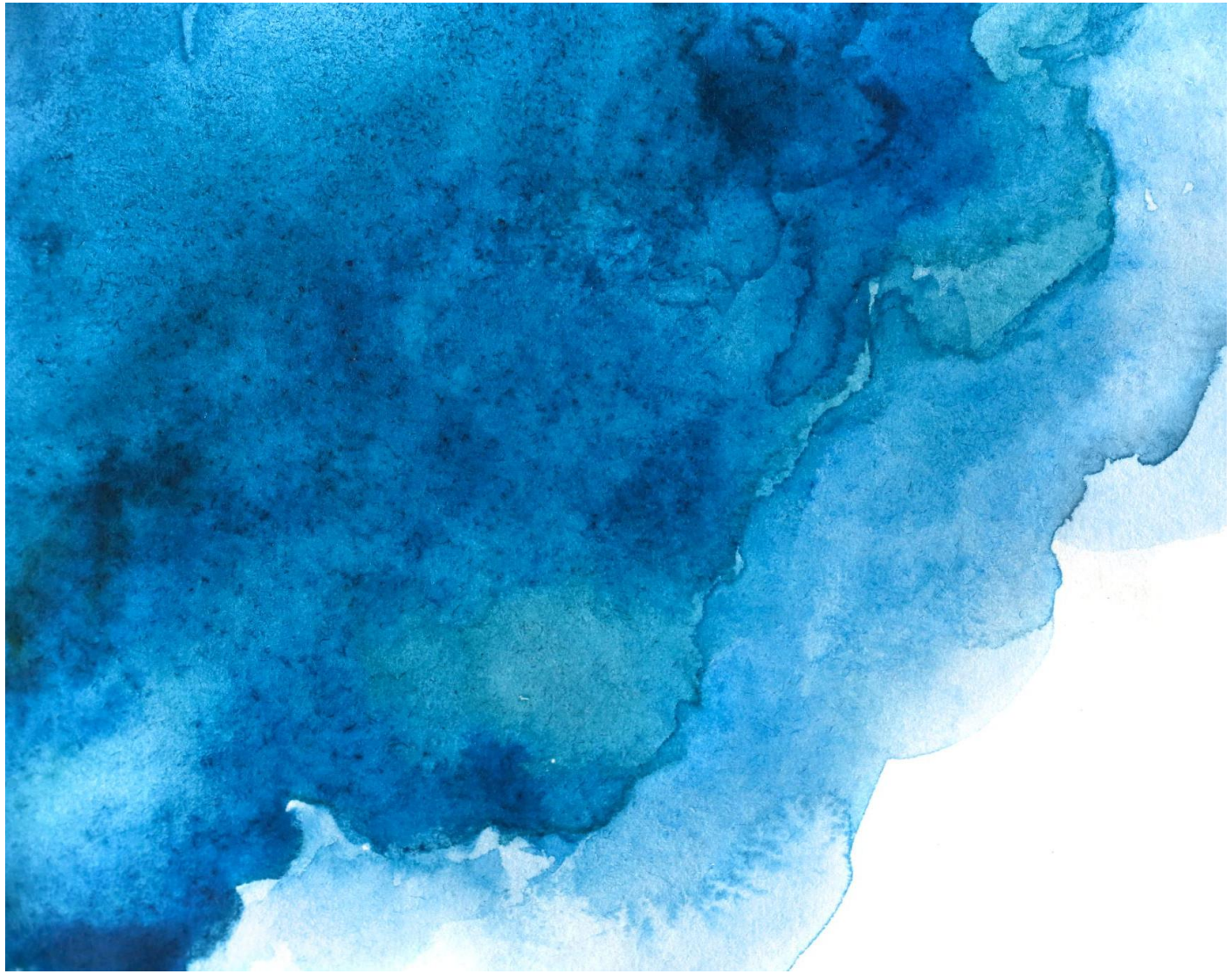

EconCast PH

POLICY FORECASTING FOR THE PHILIPPINES USING MACHINE LEARNING

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The Policy Forecasting Gap

- Policymakers need fast, data-driven forecasts to simulate policy outcomes
- Existing tools are static, fragmented, or overly technical
- There is limited local infrastructure to simulate long-term effects of social, economic, or environmental decisions

Objective

- Build a transparent and interactive tool for estimating key national outcomes based on historical data and policy inputs
- Focus on GDP, poverty rate, and GHG emissions per capita
- Enable "what if" scenario analysis with immediate feedback

Data Sources

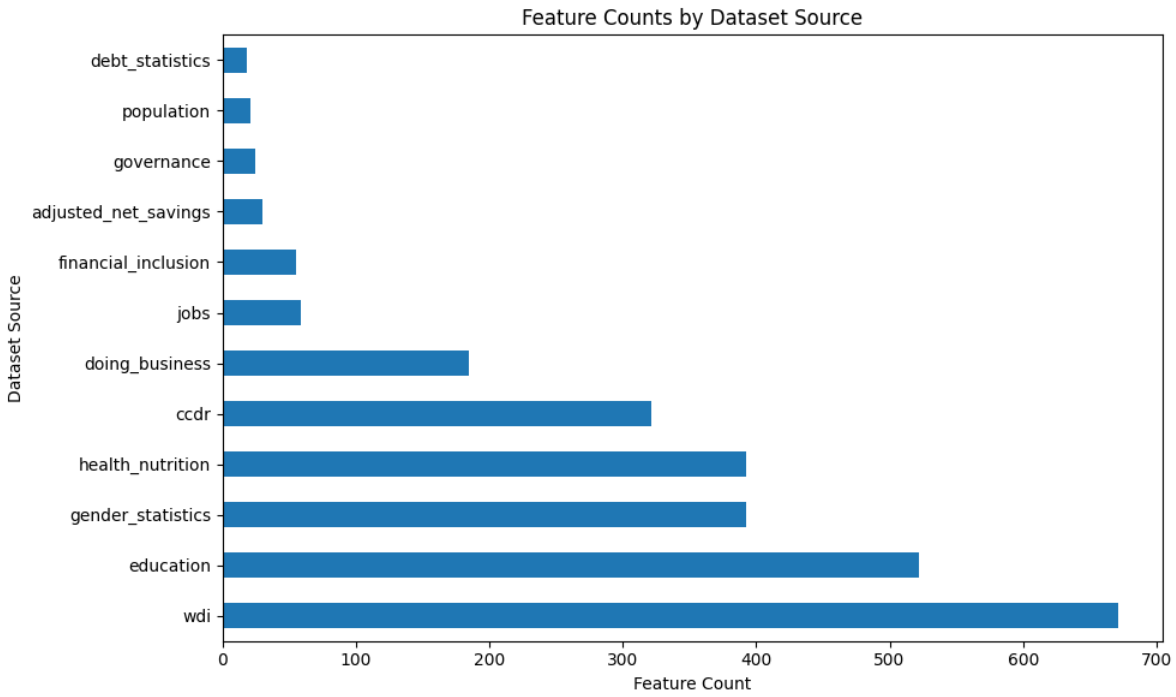
- All data sourced from the World Bank Open Data
- Includes indicators across:
  - Economic (GDP, trade, inflation)
  - Social (poverty, education, inequality)
  - Environmental (emissions, energy use)

Time span: **1970 to 2021**, single country focus: **Philippines**

Forecast Targets

- GDP per Capita (GDP per capita (current US$)_ccdr)
  - Economic growth
- Poverty Rate (% under $5.50/day) (Poverty headcount ratio at $5.50 a day (2011 PPP) (% of population)_ccdr)
  - Welfare indicator
- GHG Emissions per Capita (tons) (Per capita GHG emissions (tons/capita)_ccdr)
  - Environmental sustainability

From 2,692 Indicators to What Matters



- Removed:
  - Zero only columns
  - Low variance features
  - Sparse historical data
- Applied:
  - P value filtering
  - Autocorrelation screening
  - Final usable features: 1,175

Per capita GHG emissions (tons/capita)

Model	R2	RMSE
LinearRegression	-1.78	0.71
Ridge	-7.60	1.40
Lasso	-2.41	0.77
DecisionTree	-1.12	0.60
RandomForest	**-0.60**	**0.36**
GradientBoosting	-0.98	0.53
SVR	-1.49	0.66

Poverty headcount ratio at $5.50 a day (2011 PPP)

Model	R2	RMSE
LinearRegression	-0.19	16.20
Ridge	-2.98	37.37
Lasso	-0.12	13.59
DecisionTree	0.40	15.64
RandomForest	**0.67**	**10.15**
GradientBoosting	0.21	11.15
SVR	-0.15	13.72

GDP per capita (current US$)

Model	R2	RMSE
LinearRegression	-31.91	1205.87
Ridge	-25.61	1391.27
Lasso	-7.65	714.39
DecisionTree	-8.26	701.52
RandomForest	-8.32	677.17
GradientBoosting	**-6.65**	**562.79**
SVR	-25.01	938.44

Model Selection and Evaluation

All applicable models were tested, including:

- Linear Regression, Ridge, Lasso
- Random Forest, Gradient Boosting, SVR, Decision Tree
- Metrics: R^2, RMSE, 5 fold cross validation
- Random Forest selected based on balance of accuracy, robustness, and interpretability

Conclusion

- Gradient Boosting worked best for GDP per capita but overall performance was poor.
- Random Forest was the most consistently effective across all targets.
- Poverty prediction was the most stable and interpretable.
- Emissions and GDP forecasting may require more focused features or advanced modeling techniques to improve accuracy.

Forecast Accuracy (Random Forest)

HIGH PERFORMANCE ENABLED STRONG, RELIABLE POLICY SIMULATIONS

Evaluation Metrics

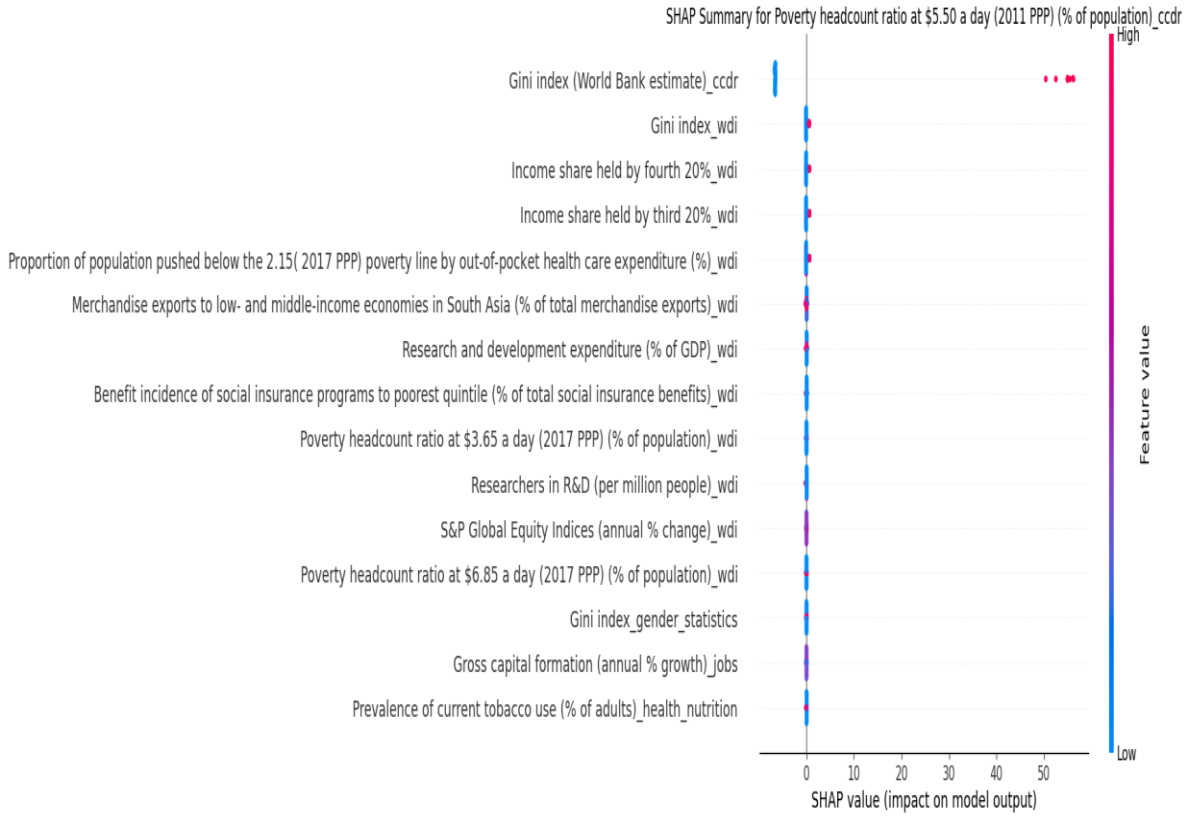
Target	R2 Score	RMSE
GDP per capita (current US$)	0.9997	21.30
Poverty headcount ratio at $5.50/day (2011 PPP)	0.9999	0.21
Per capita GHG emissions (tons/capita)	0.9978	0.04

What Drives the Forecasts?

- For GDP per capita (current US$)
  - Adjusted savings: mineral depletion (current US$)
  - Merchandise exports to high-income economies
  - Political stability indicators
  - Emission totals from LULUCF and forest fires

Insights:

- GDP growth is primarily associated with extractive industries and mineral depletion.
- Political stability and trade patterns also contribute significantly.
- Emissions data appears marginal but may signal broader industrial activity.

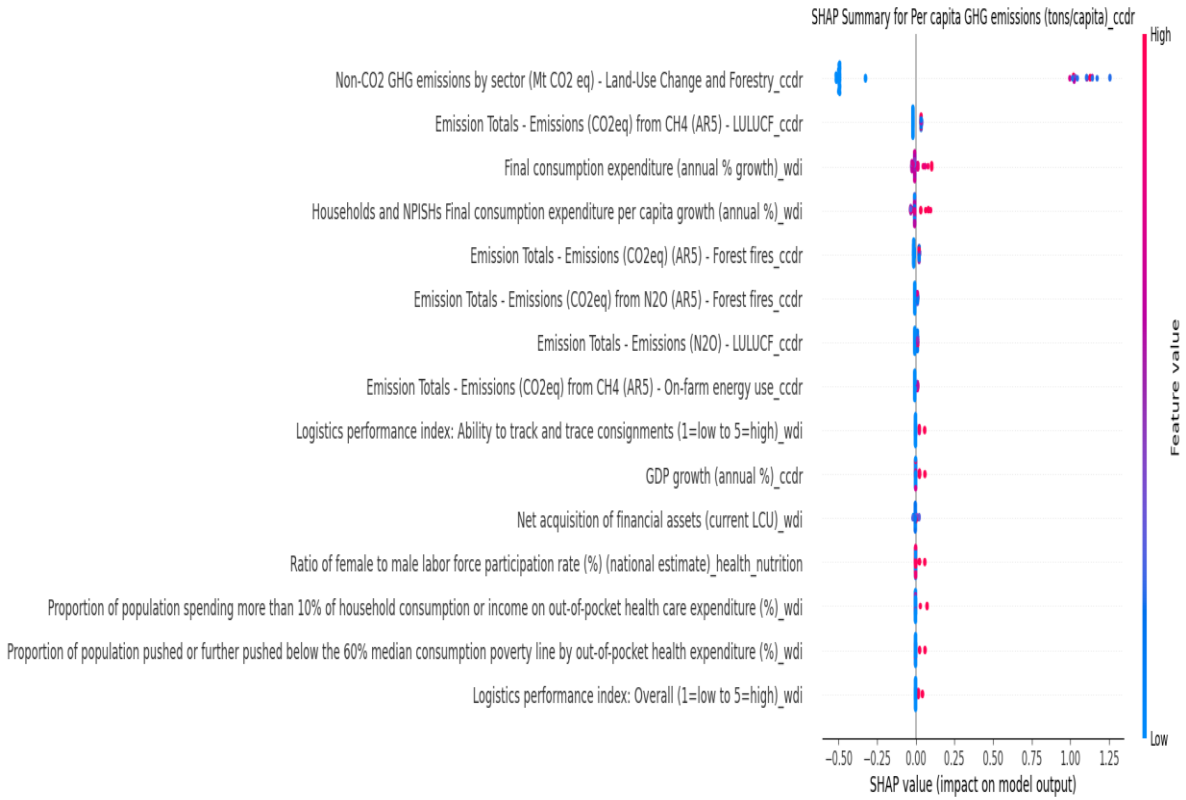


For Poverty headcount ratio at $5.50/day (2011 PPP):

- Top Features by Random Forest Importance:
- Gini index (inequality measure)
- Health-related poverty metrics
- Income share across population quintiles
- R&D expenditure and social program targeting

Insights:

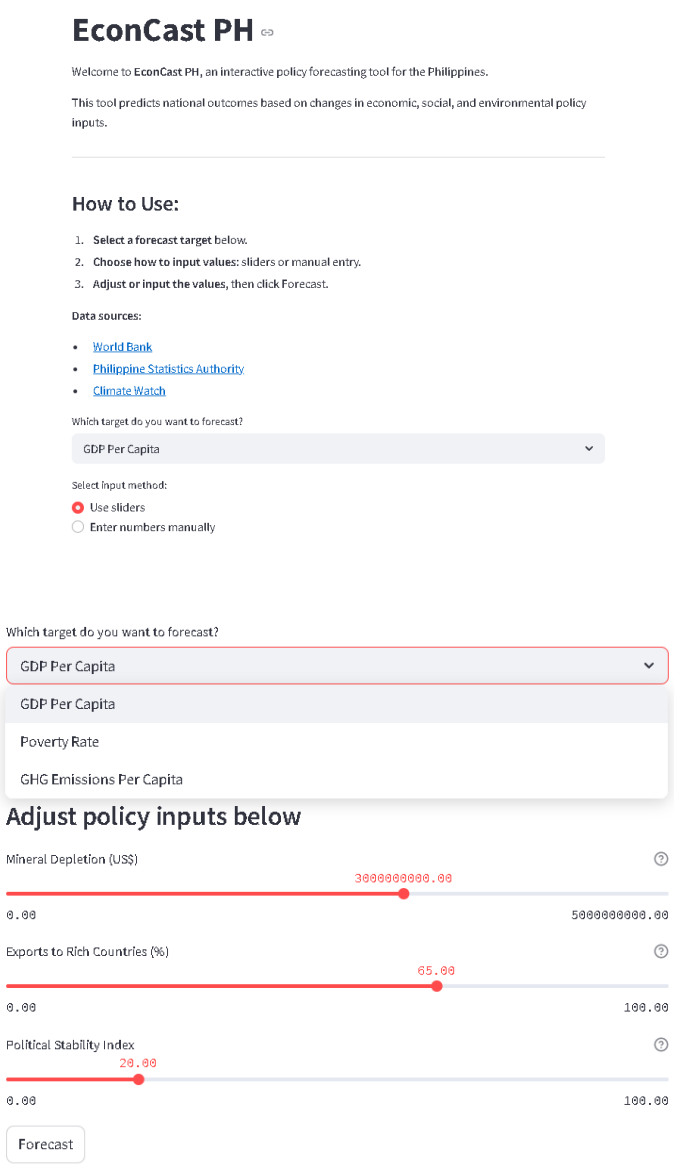
- Inequality (Gini index) dominates as the strongest explanatory factor for poverty levels.
- Out-of-pocket health expenditure and social safety net targeting to lower quintiles are also key levers.
- Education and R&D contribute marginally, likely via structural effects.



- For Per capita GHG emissions (tons/capita)
  - Top Features by Random Forest Importance:
  - Non-CO2 emissions from land-use change and forestry
  - CH_4 and N_2O emissions from agriculture and energy use
  - Household consumption growth

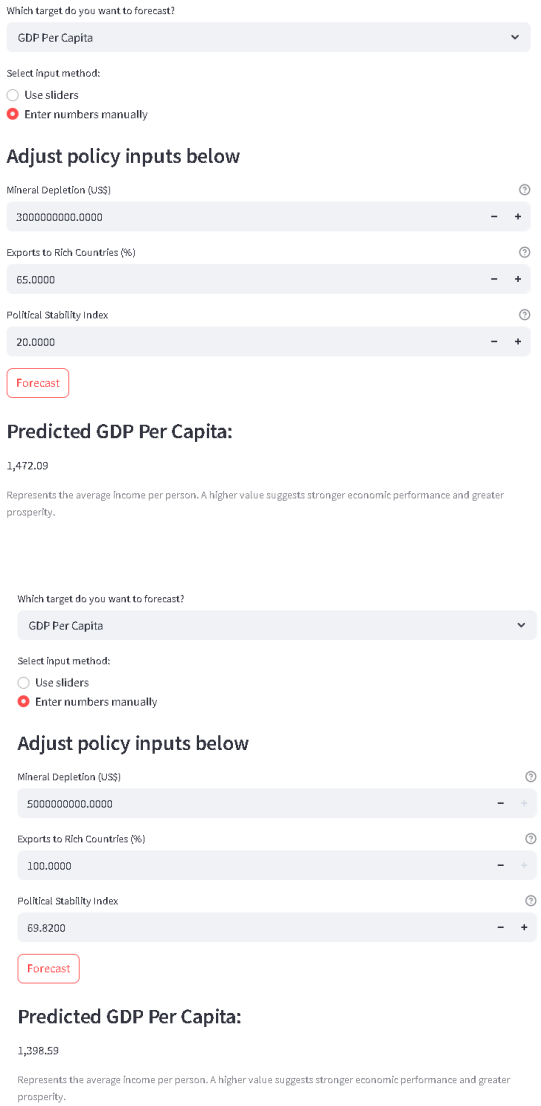
Insights:

- Emissions are primarily driven by land-use, forest fires, and agricultural emissions.
- Consumption patterns and economic growth have a measurable but secondary role.



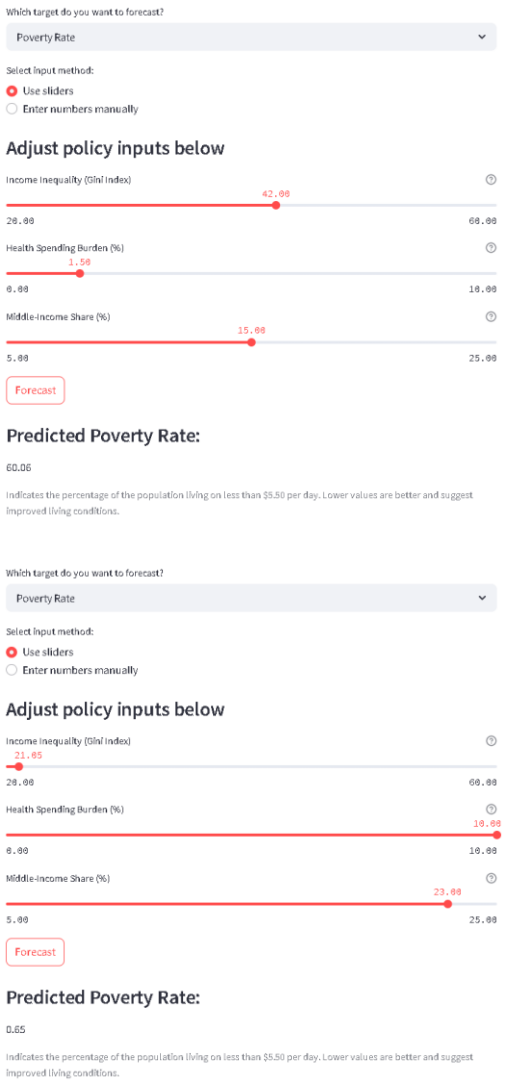
Deployment: Hugging Face + Streamlit

- Deployed on Hugging Face Spaces using Streamlit
- User selects a target, inputs policy values (sliders or manual), gets forecast + explanation
- Hosted at: https://huggingface.co/spaces/FatYuna19/econcast ph

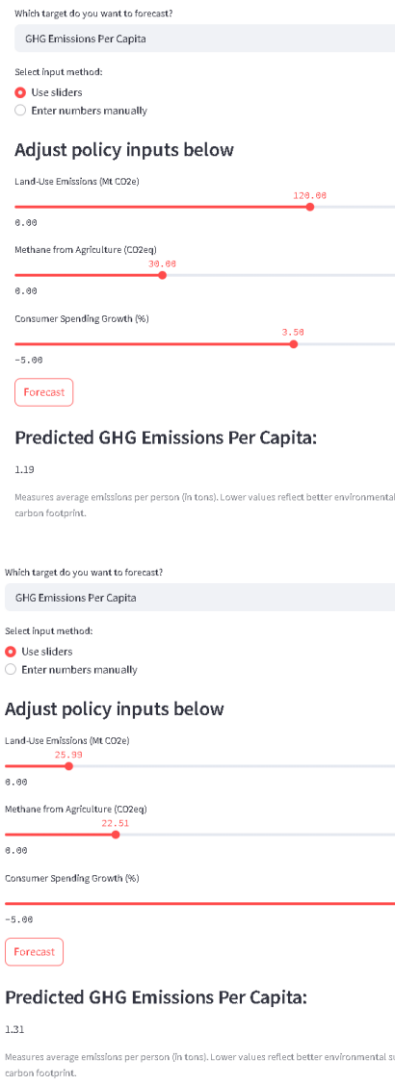


What Happens When You Change a Policy Lever?

- Despite higher export orientation and political stability in Scenario B, the increased mineral depletion may have lowered the forecasted GDP per capita. This highlights how environmental degradation can offset economic policy gains. Scenario-based simulations like these help policymakers weigh tradeoffs between growth, resource use, and governance improvements.



- Drastically lowering income inequality and shifting resources to the middle class significantly reduces projected poverty. However, a spike in health cost burden slightly offsets gains, showing how multiple factors can work against each other. Scenario B represents a high-equity but high-risk health environment.



- Cutting land-use and agricultural emissions significantly reduces per-person carbon output. However, strong consumer growth can partially offset environmental gains. Scenario B reflects a high-growth, high-consumption path that raises emissions despite lower methane and land use activity.

Impact and Applications

- Forecasts are fast, transparent, and scenario based
- Helps policymakers assess tradeoffs (growth vs. sustainability)
- Can be expanded to other countries or indicators

Thank You

- Reach out for collaborations, feedback, or ideas