中国省エネ・排出削減と生態文明構築：理論と実践

China's Theory and Practice on Energy Conservation, Pollution Reduction, and Ecological Civilization Construction

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報告骨子 Outline

1. 中国持続可能な成長の進展:省エネ排出削減と生態文明
   Progress to Achieve China's Sustainable Development
2. 今後の中国の排出ピークと情勢判断
   Future Scenarios and Emissions Peaks
3. キャップ管理、グリーン発展と生態文明制度構築
   Cap Management, Green Development, and Institutional Arrangements for Ecological Civilization

中国の新成長理念
New development idea

- **従来型政策手法:新理念、指導意見、計画策定、実証･プロジェクト、本格推進 Traditional policy path: idea, guidance, plan, pilot & program, scaling up**

- **2002:** 新型工業化 **New industrialization path**
- **2003:** 科学的発展観 **Scientific development concept/balanced development** ***pay more attention to sustainable development***
- **2004:** 両型社会, 循環経済 **Resource-Efficient and Environment-Friendly Society (REEFS) and Circular Economy (CE)**
- **2005:** 和諧社会, 創新型国家 **Harmonious Society including man and nature relationship; Innovation-oriented country**
- **2006:** 省エネ・排出削減 **Energy efficiency and pollutants reduction approach, target-oriented policies (legally binding domestically)**
- **2009:** グリーン低炭素発展 **Green and Low-carbon development**
- **2011:** 経済成長方式転換 **Transformation of economic development pattern: green-leading in some extent**
- **2012:** 生態文明構築 **Ecological Civilization (EC): green, low-carbon and circular economy development, new governing philosophy**

2000年以降採択・改訂の環境保護とグリーン成長関係法規
Legislations for promoting environmental protection and green development since 2000

- 水法　Water Law (issued, 1988; amended, 2002)
- 環境アセスメント法　Environmental Impact Assessment Law (issued, 2002)
- 省エネ法　Energy Saving Law (issued, 1997; amended, 2007)
- 循環経済促進法　Circular Economy Promotion Law (issued, 2008)
- 再生可能エネルギー法　Renewable Energy Law(issued, 2005; amended: 2009)
- クリーン生産促進法　Cleaner Production Promotion Law(issued, 2002; amended, 2012)
- 環境保護法　Environmental Protection Law (issued, 1989; amended, 2014)

省エネ排出削減目標誘導政策と総合的措置（2006-2015）

Target-oriented policy for energy saving and pollution reduction and comprehensive implementation program (2006-2015)

- 五ヵ年計画体系と総合的手段 **National Five-Year Plan (FYP): 11th FYP (2006-10); 12th FYP (2011-15); target-oriented**
  - **5-10年の戦略 Long-term strategy: realize the new development approach**
  - **拘束性指標 Mandatory targets approach: energy efficiency and key pollutants reduction (indicators added continuously)**
  - **法的拘束力あり Legally binding domestically**
- 部門の計画と重点計画 **Sectoral plan:** such as resource & energy efficiency, renewable, pollution reduction, new energy vehicles, green industry
- 地方計画体系 **Local FYP**
- 行動計画と実施案 **Action plan and comprehensive implementation program**

12-5計画期間中のグリーン指標
Green targets during 2011-15

- グリーン指標 **Green targets: 7 types with 12 targets (11 mandatory targets)**
- 拘束性指標 **Mandatory targets: allocated to provinces**
  - **Energy intensity, 16% ↓**
  - **Carbon intensity, 17% ↓**
  - **Share of non-fossil energy, reach at 11.4% (8.3% in 2010)**
  - **Pollutant reduction:**
    - ✓**COD: 8%↓**
    - ✓**SO_2: 8% ↓**
    - ✓**NH_3-N: 10% ↓**
    - ✓**NOx: 10% ↓**
    - ✓***$PM_{2.5}$ and PM_{10}: ↓, new target for medium- and long-term, build monitoring system first, not in the FYP but action plan is available***

12-5計画期間中のグリーン指標
Green targets during 2011-15

- 拘束性指標 **Mandatory targets (cont'd):**
  - **Arable land: keep the area at 1.2 Bn ha.**
  - **Forrest increase:**
    - ✓**forest cover: reached at 21.66% (20.36% in 2010)**
    - ✓**timber stock volume: 600 Mn M^3 ↑**
  - **Water use per unit industrial value-added : 30 % ↓**
- 推定指標 **Predicted targets:**
  - **Agricultural irrigation coefficient: reach 0.53 (0.5 in 2010)**
- その他の指標 **Other targets considered:**
  - **resources productivity: 15% ↑**
  - **total energy consumption (reasonable control)**

12-5計画期間中のグリーン指標
Green targets during 2011-15

- 再生可能エネルギー **Renewables:**
  - **Hydro power: 290 GW**
  - **Wind: 100 GW (grid-connected; 5 GW off shore)**
  - **Solar: 21 GW**
  - **Biomass: 50 Mtce**
  - **Solar heating: accumulated at 400 Mm^2**
- 新エネルギー自動車 **New energy vehicle:**
  - **500,000 accumulated sale in 2015 (battery electric vehicle and plug-in hybrid vehicle, ambitious)**
  - **Fuel economy: 6.9 l/100km for passenger vehicle**

2020年以降のグリーン指標
Green targets in 2020 and beyond

- 拘束性指標 **Mandatory targets:**
  - **Carbon intensity, 40-45% ↓ (2005-2020)**
  - **Share of non-fossil energy, 15% (target in 2015: 11.4%)**
  - **Forest area: 40 Mn ha. increase (2005-2020)**
  - **Timber stock volume: 1.3 Bn m^3 increase (2005-2020)**
  - **Pollutant reduction: action plans on air and water pollution control available or coming soon**
- 国家気候変動対応計画（2014—2020年）
  National Plan for Addressing Climate Change (2014-2020)
- その他の関係指標 **other targets ?**
  - ✓ **Carbon emissions peak by about 2030 or before**
  - ✓ **Share of non-fossil energy, 20%**
  - ✓ **Total energy/coal consumption**
  - ✓ **PM2.5 and others**

共産党18回大会と18期三中全会の生態文明制度構築

Institution Building of EC by the 3rd plenary session of 18th CPC Central Committee

- **改革の全面的深化に関する若干の重要問題に関する決定 Decision on Major Issues Concerning Comprehensively Deepening Reforms**
- **生態文明構築は“五位一体”の重要要素;実現ルート:グリーン低炭素循環発展**

  Ecological Civilization (EC) crucial; Path to EC: develop the green, low-carbon and circular economy
- **重点 Key points**
  - 让市场发挥决定性作用 make the market a decisive role for resource allocation
  - 更好发挥政府作用 play the role of government better
  - 用制度保护生态环境 protect the environment based on the institutions
  - 构建生态环境治理体系 build an environmental governance system
- **生態文明制度構築を突出 Highlight the institutional arrangements for EC**
  - Balance among Government, Market, and Society; Dilemma: Dev. vs. Environ.
  - Resource management: improve the property right system of natural resource/capital
  - Ecological conservation: set up “eco-redline”
  - Environmental protection: reform of management system / governance and responsibility, the 3rd part participation/PPP
  - Some key institutions/policies suggested, esp., market-based instruments
  - **Priorities**: price; resource and environmental tax; trading for emissions right/energy consumption cap/energy increment/EE

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Cap Management, Green Development, and Institutional Arrangements for Ecological Civilization

生態文明構築における発展要素（1）
Comprehensive factors for socio-economic development in a context of ecological civilization formulation (1)

- 国内要因 **Domestic factors/issues (interrelated for developing economy)**
  - **経済成長**：人口増加、工業化、都市化、**経済セキュリティ、中所得、新常態**
    Economic development: population, industrialization, urbanization, economic security, middle income, the new economic normal
  - **社会発展：コンセンサス、立法過程、雇用、地域格差、社会安定**
    Social progress: consensus, legislation process, employment, regional disparity, social stability
  - **環境保護**：資源エネルギー供給安全保障，**スモッグ/PM2.5**、水汚染、土壌修復，炭素削減、適応
    Environmental protection: supply of resource/energy, **haze/PM2.5**, water pollution, soil restoration, mitigation and adaptation
  - **イノベーションと競争力** Innovation and competitiveness
  - **急速な質的構造的変化への適応**：投資消費構造、産業構造、中所得、労働年齢人口供給等 Fit into with the rapid changes in both scale and structure
  - **実践経験：“11－5”、“12－5”計画の省エネ排出削減と低炭素モデル**
    Experience during 11th and 12th FYPs on energy efficiency and low carbon pilot

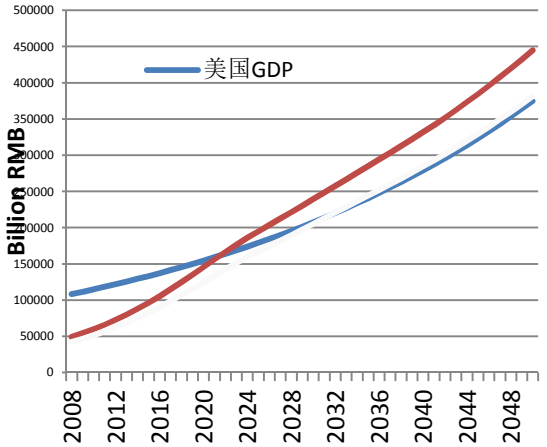
生態文明構築における発展要素 (2)
Comprehensive factors for socio-economic development in a context of ecological civilization formulation (2)

- 国際的要因 **International aspect: political, economic, and tech.**
  - ➢削減・緩和と適応義務 mitigation and adaptation obligations
  - ➢**成長貢献：経済復興、国際分業と産業チェーン**
    Growth contributions: economic restoration, international labor division and industrial chains
  - ➢世界のグリーン経済と成長モデル転換の経験，**新国際ルール、ベンチマークと基準等**
    International experience and lessons on green economy and transformation, **emerging int'l rules (TPP, TTIP, etc.), benchmark and standards**
  - ➢グローバル協力 Global cooperation at all round
  - ➢ **モデルの共同開発と改造の難点：急成長と構造変化，管理の不確実性，非価値化要素**
    Difficulty: rapid growth and structural changes, manage uncertainty
- **考慮すべき要素が増加，“社会経済–エネルギー–環境–炭素排出–政策”の総合的シナリオと均衡モデル構築の必要性，以って段階的判断の過誤を回避**
  Increasing factors considered, equilibrium model and integrated scenario needed

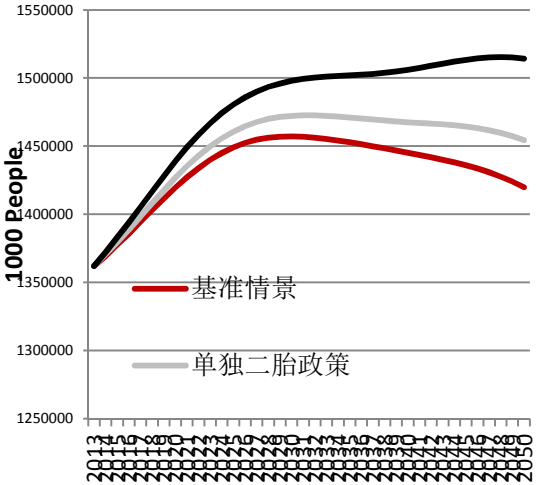
ベースライン：高度成長と転換
Baseline : China’s fast development

- 将来の中国の経済成長は徐徐にスローダウン；
- エネルギー排出増加は経済成長に依存，エネルギー増加もスローダウン;
- ベースラインにおいてはこれまで効率向上と改善をあまり考慮してこなかった。

- China's economic growth will gradually slow down in the future;
- Energy emissions growth is dependent on the overall economic growth;
- In the baseline, we do not think too much about the energy efficiency and



	2015	2020	2025	2030	2035	2040	2045	2050
population	1.377	1.410	1.449	1.457	1.453	1.445	1.436	1.420
Economic growth rate	7.5	7	6	5	4.5	4.0	3.7	3.5
Urbanization	56.4	60.0	63.0	66.0	68.3	70.5	72.8	75.0
Portfolio of Service Industry	44.46	44.50	47.35	50.20	53.20	56.20	58.70	61.20
Energy intensity Tons of standard coal per USD GDP)	0.10	0.09	0.09	0.08	0.07	0.07	0.06	0.06



政策とシナリオ選択の目標
Targets of policy and policy path design

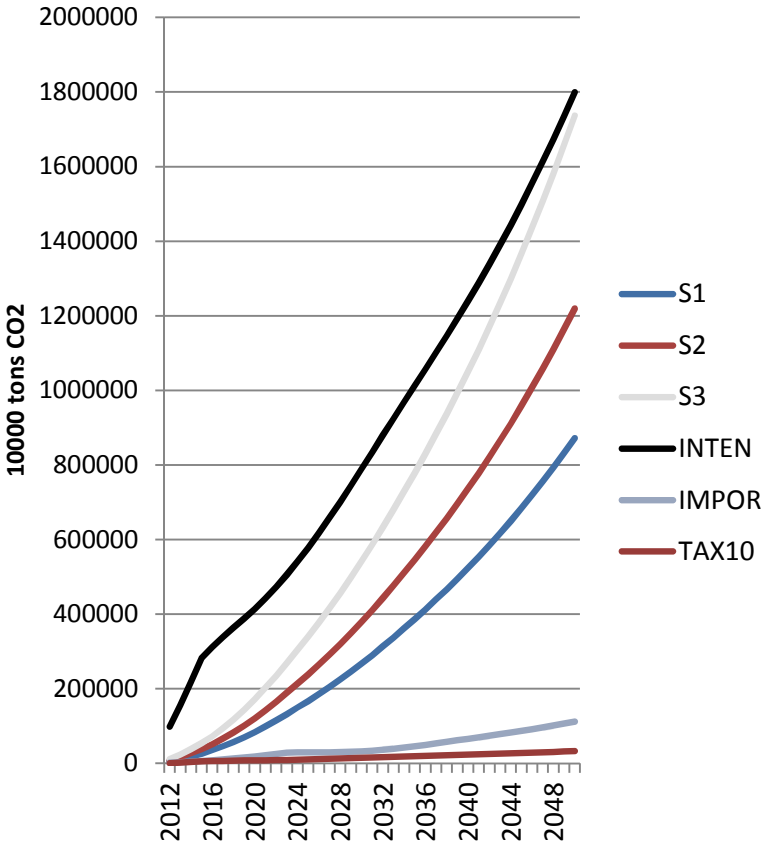
- 異なるシナリオで早期に炭素排出ピーク値を確定；
- 石炭消費のピークを適時に抑制（最大の排出源，同時に最も安価なエネルギーの1つ）；
- 汚染対策と炭素削減を同時に実現；
- 受容可能なコストで上記目標を実現

- Control the CO_2 emissions get to a peak as early as possible
- Control the coal consumption which is the biggest emission source while the cheapest energy in China to a peak at a reasonable timeframe
- Co-benefit for PM2.5 and Carbon reductions
- Realize the controls with affordable costs

政策選択と排出削減効果

Policies option and their emission reductions

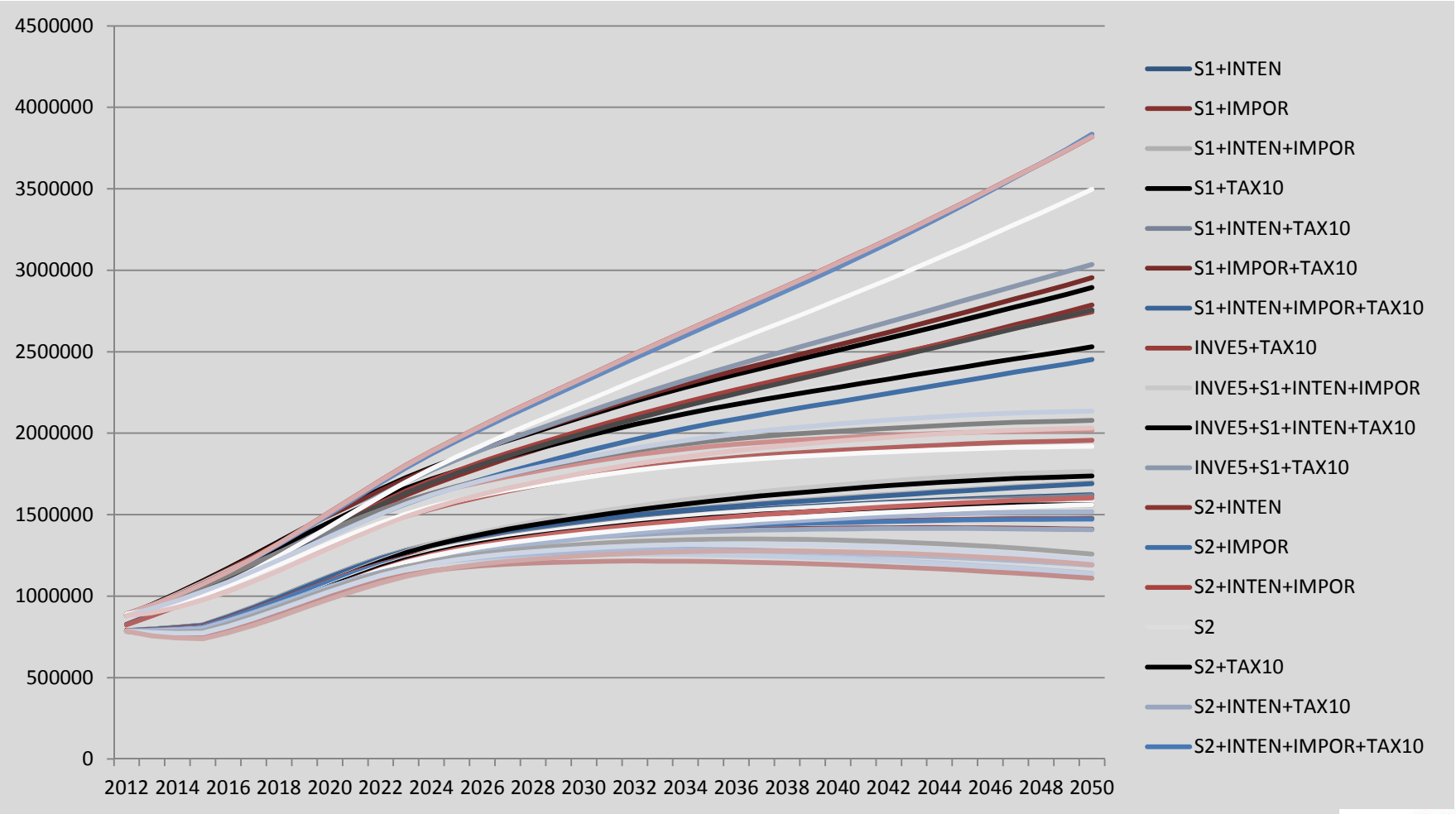
能源结构 / Energy Mix (S)	高油情景 / high oil
	高煤情景 / high coal
	高非化石能源情景 /high non-fossil
能源强度 / Energy intensity	2015年降低16%，至2050年降低50% / decreases 16% by 2015; 50% by 2050
进口依存度 / Import dependency	进口能源占比小于65% / ≤65%
投资消费比重 / Investment-consumption ratio	
碳税/Carbon Tax	10 元/吨CO_2排放 / ¥10/tCO_2
	100元/吨CO_2排放 / ¥100/tCO_2
碳税的再利用/ Use of carbon tax	返还企业 / Return to enterprises
	补贴居民 / Return to households



単一政策ではCO_2ピーク値目標実現不可 → 政策のミックスの必要性

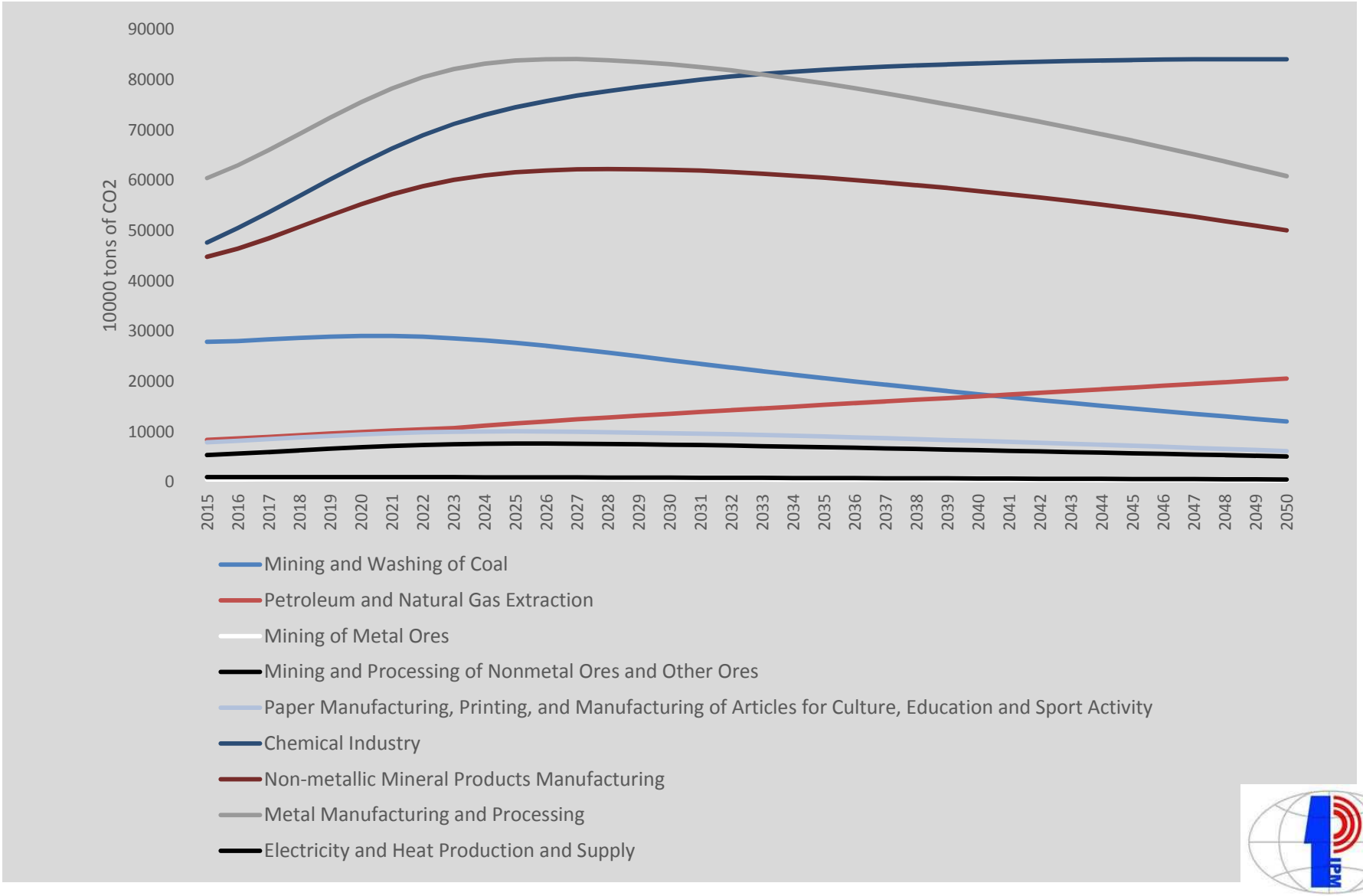
No a single policy can realize the carbon peak → Policy mix

複合的政策における炭素排出
Carbon emissions by policy mix



複合的政策シナリオによるエネルギー集約型産業排出ピーク値

Emissions Peak of energy-intensive industries by policy mix scenarios



複合的政策– 傾向と対応ピーク値

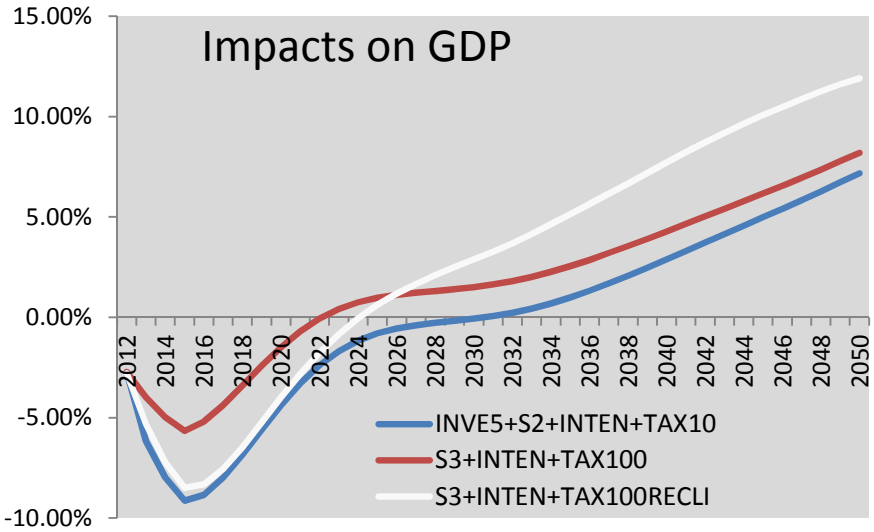
Peak value and timeframe by policy mix scenarios

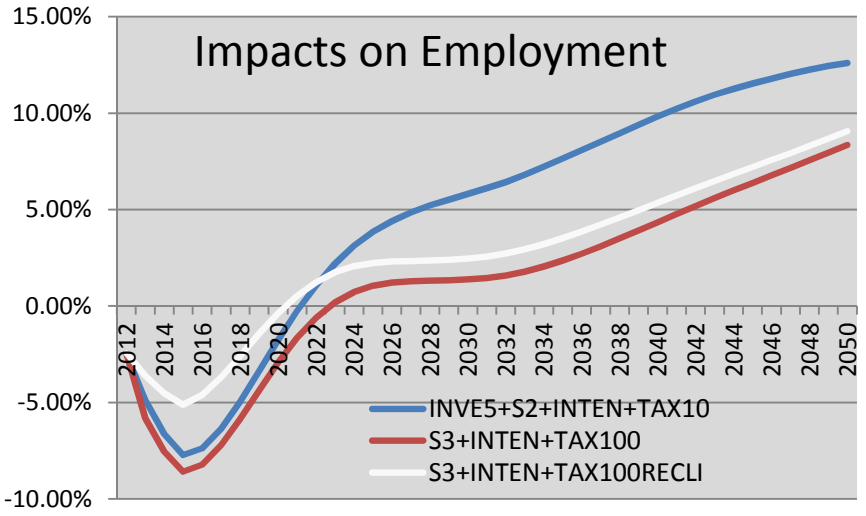
	单位	峰值/peak value	达峰时间/Peak timeframe	政策组合/Policy Mix
人口/population	Bn.	1.47~1.51	2031~2046	单独二孩政策; 全面二孩政策
煤炭消费总量/Coal consumption	Bn. tce	3.33~4.63	2027~2048	高非化石能源+降低能源强度+ 100元碳税; 高油+ 降低能源强度+ 10元碳税
能源消费总量/Energy consumption	Bn. tce	4.77~6.12	2032~2049	高煤 +降低能源强度+ 10元碳税 高非化石能源+降低能源强度+ 100元碳税
$PM_{2.5}$	Mn. t	9.62~15.49	2027	高非化石能源+降低能源强度+ 100元碳税; 高非化石能源+ 降低能源强度+ 10元碳税
重工业部门排放/High energy intensive sectors' emissions	Bn. tCO_2	4.96~5.04	2032~2034	高煤 +降低能源强度+ 10元碳税 高非化石能源+降低能源强度+ 100元碳税
CO_2 emissions	Bn. tCO_2	12.15~15.61	2032~2049	高非化石能源+ 降低能源强度+ 100元碳税; 高油+ 降低能源强度+ 10元碳税

- エネルギー構造+炭素税：2030年CO_2排出総量は基準シナリオの 11.3%–33.3%削減
  Energy structure + Carbon tax: in 2030, CO_2 emission reduced by 11.3%-33.3%
- エネルギー管理強化の付加：2050年CO_2排出総量は2015年に相当
  + energy intensity: In 2050 the CO_2 emissions will be at the same level of 2015

受容可能なコストにより削減目標を達成
Reducing emissions with affordable costs

GDPか、雇用か?





- 2030年以前は参考シナリオと比較して異なる政策シナリオのシュミレーション結果は年平均GDP損失が約1.3-3.7%;2030年以後はプラス効果;2022 年以前は年平均雇用が3.16-5.28%減少，その後増加
- エネルギー強調整によるピーク到達時間調整:1年繰り上がる毎にGDPは 2.13%多く損失
- エネルギー構造によるピーク到達時間調整:1年繰り上がる毎にGDPは2.31%多く損失
- Before 2030, compared with the reference scenario, the simulation of policy-mix scenarios shows that peaking emissions by 2032 could also averagely shave about 1.3-3.7% of China's GDP; employment reduced annually by 3.16-5.28% before 2022
- Adjust peak by Intensity: GDP lose additionally 2.13% for each one year earlier than 2032
- By energy structure: GDP lose additionally 2.31% per year

中国資源環境ピーク値組み合わせの結論
Conclusions for peak package simulation

- 基準シナリオでは炭素排出ピーク値実現困難，人口、エネルギー消費、排出等のピーク値が相互に連関・影響

  Peaks of population, energy consumption, and carbon emissions are linked to each other

- **中国の主なピーク値期間：今後10-20年内に主要資源消費と汚染物排出がピークに；多くのモデルでフィージブルな炭素ピークは2025-40年の間；エネルギー構造調整は炭素ピーク値に極めて重要**
  - 人口総量：2031-2046年
  - 石炭消費総量：2026-2030年；段階規制目標は“１３－５”から，目標年は2025年可
  - PM2.5排出総量：2026-2030年；重点区域は前倒し可
  - 炭素排出ピーク：2031-2035年，ピーク値目標年は2030年可
- **Peak timeframe: will reach at peaks of main resource use and emissions in 10-20 years; the carbon peaks of most models are around 2030; energy mix restructuring crucial for carbon peak**
  - Population: 2031-2046 (plateau period)
  - Coal consumption: 2026-2030； target year for peak to strive for: 2025
  - PM2.5: 2026-2030； partial region could reach at peak earlier
  - CO_2 emissions: 2031-2035; target year to strive for: 2030

中国資源環境排出ピーク組み合わせの試み
Challenges for peak package simulation

- ピーク実現には総合的政策が必要: 目標+ロードマップ+技術+資金+政策+きめ細かな管理
  Integrated policy solutions are needed for realizing the peaks package: target + roadmap/b-model + tech+ +policy mix + fine management + etc.
- 成長方式の革新 **Promote transformation of development pattern with innovation**
- エネルギー構造調整と炭素強度削減が炭素排出ピークと持続可能成長実現の重要手段
  Adjust energy structure and reduce energy intensity are the fundamental way for achieving peaks
- 炭素税、炭素市場或いはその他の市場メカニズムを排出削減の補助手段に
  Carbon tax, carbon market, and other market-based instruments could work as supplemental ways to reduce CO_2 emissions
- 炭素ピーク実現は総合的コストが鍵。前倒し到達（2030年以前等）は国内経済と雇用に影響、更に世界経済の福祉下降を招きかねない
  If China reach at the carbon peak earlier than 2030, it would cause the reduction of global welfare (based on MRICES-CINCIA simulation)
- 不確実性：経済成長、エネルギー構造変化、国際協約、ピーク管理能力、データ、モデル偏差等
  Manage the uncertainty/risk

报告提纲 Outline

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新常態下の生態文明構築

Building Ecological Civilization and in the New Normal

- **新常態 the "new normal" economy**
  - 中高速成長、低エネルギー弾性？ GDP: 6-7%, energy elasticity: 0.5 ?
  - 経済成長方式転換 economic transition
  - エネルギー転換 energy mix transition
  - 消費形態の転換 change of consumption pattern
  - 資源環境的影響 resource and environmental impact

- **生態文明構築 Building ecological civilization**
  - ピーク管理の社会経済発展への影響
    Impact by resource/coal/emissions cap
  - 新興グリーン産業によるサポート
    Support by new green, circular, and low-carbon economy
  - 生態文明制度構築下のピーク管理 Cap Management in a context of EC institution: legislation, price/fee/taxation reform, emission trading, etc.

炭素排出総量管理の制度構築（1）
Institutional Arrangements for the Management of Carbon Emissions Cap (1)

- 立法 **Legislation**
  - 環境法修正案 Amendment of Environmental Protection Law
    - ✓ 重要原則と制度構築 implementation of basic principle and institutional arrangements
    - ✓ 実施細則制定
  - 大気汚染防止法、水汚染防止法の改正、土壌汚染防止法の起草 Amending of air/water pollution prevention and control law, drafting soil pollution law
  - 環境保護税法 Environmental taxation act (inclu. carbon tax?)
  - 気候変動立法
    - ✓ 人大常務委員会決定 Voting a decision by the NPC standing committee
    - ✓ 5カ年計画編入 Mainstreaming in the 13th FYP
    - ✓ 気候変動対策法（総量、排出権等）と関連条例 Climate change law, related regulations such as carbon market management
  - 原子力安全法 Nuclear safety law
  - グリーン・低炭素業界基準、IPR保護と法執行強化 sectoral standard, IPR protection and enforcement; low-carbon product standard, labeling and certification system
- 法執行と司法の強化 **Strengthening enforcement and justice**

炭素排出総量管理の制度構築 (2)

Institutional Arrangements for the Management of Carbon Emissions Cap (2)

- 行政管理体制改革 **reform of administration system**
  - 一元的指導、多部門参画・調整 multi-sector involvement
  - エネルギーと気候変動総合管理部門 Comprehensive/Macro administrative authority for Energy and Climate Change
  - 緻密、適応性、リスク管理 fine, adaptive, and risk mgmt.
- 協調コントロールプラン **National co-control action plan**
  - 部門協調 multi-sector coordination
  - 地域協調 multi-region coordination
  - プロジェクト協調:エネルギー効率、汚染物質、CO_2等， multi-pollutant, co-benefit, co-control
- キャパシティ・ビルディング：管理方法、統計、会計、評価、会計検査等関連制度 **Capacity building**

炭素排出総量管理の制度構築(3)

Institutional Arrangements for the Management of Carbon Emissions Cap (3)

- グリーン低炭素財政制度の革新：投融資メカニズム革新、市場メカニズム
  Innovative financing institution /with PPP
  - 資源・環境価格改革と資源税徴収 Energy price reform and resource tax for fossil energy; carbon tax ?
  - 再生可能エネルギーと低炭素投融資 invest green and low-carbon economy: renewables, e-mobility, etc.
  - 総量規制と排出権取引 Cap & Trade / ETS
  - 経済政策比較研究 Comparative study on market-based instruments and schemes
  - 外部性と公共物品 externality and public goods
- 国際協力 **International cooperation**
  - エネルギー転換 energy transformation
  - エネルギー効率技術等 advanced energy efficiency tech, etc.
  - 最適管理の実践 best practice: policy, mgmt., standard, etc.
  - 協力プラットフォーム形成 building cooperation plateform

ご清聴ありがとうございました！

Thanks for your attention!

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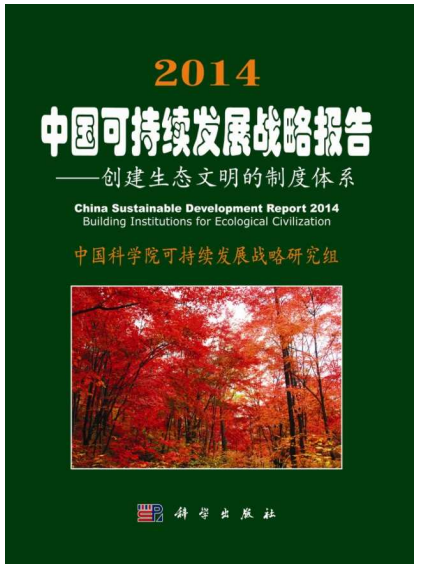

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