



Climate Finance: The Funding Challenge of the transition toward a low-carbon society

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The menu

1. Overview of the climate finance galaxy
2. Economic analysis of Low-carbon projects
3. The architecture of a climate-friendly finance

Climate Negotiations Background and the Rise of a Climate Finance Agenda

- Impasse of the « **unique-carbon-price-only framework** »
 - Global Carbon Tax vs. Cap-and-trade system
 - => diplomatic non-starter
- **The Cancun « paradigm shift »**
 - From « *fair burden sharing* » to « *substantial opportunities to ensure continued high growth and sustainable development* »
 - From « *Legally binding* » to « *outcome with legal force* »
- **Development + climate objectives** = no carbon intensive lock-in of emerging countries
- A pragmatic Call for scaling up **climate finance**
 - Public Finance Mechanisms
 - Green Climate Fund
 - Target: 100 billions \$/year



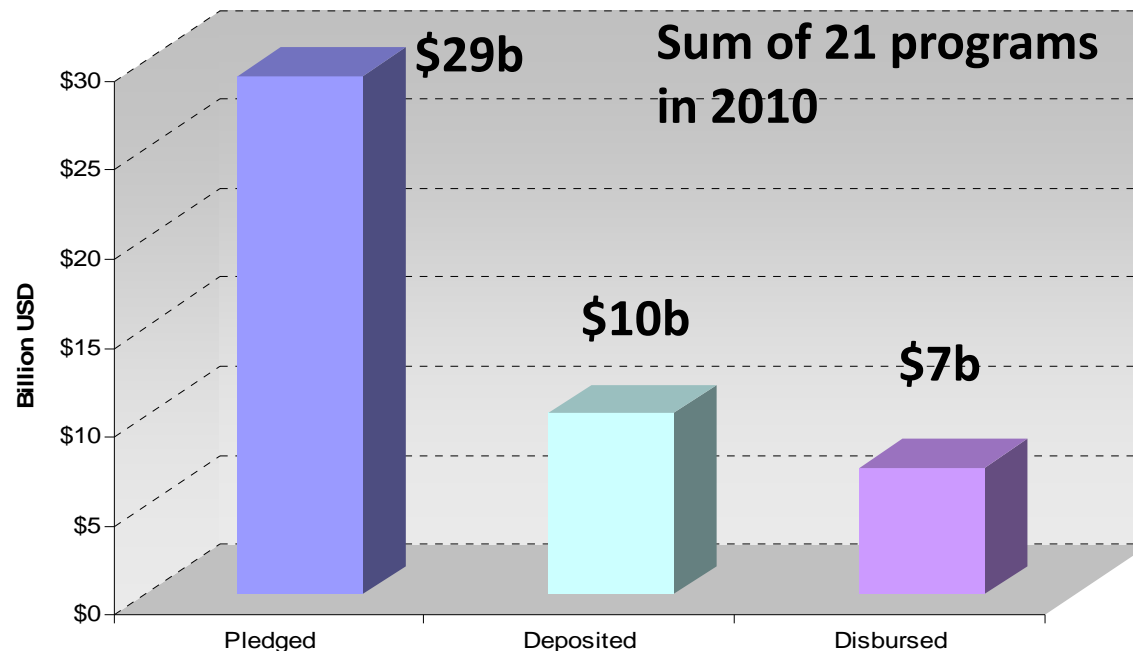
A paradigm shift in a untimely context?

Assessing the Funding Gap

- The funding needs: **rough estimates**

	World Bank (WDR 2010)	IEA (WEO 2009)
Incremental investment costs	In developing countries: \$ 140 – 175 b/year In the world: \$250 to 381 b/year	US\$ 11 trillion over 2008-2030, i.e. 3% of GFCF

- Limitations** of current climate finance initiatives



- CDM: ex post cash flows only
- Low leverage ratios of PFMs
- Green Climate Fund: limited by the « **donors' fatigue** »

The Funding Challenge is Significant though Reachable!

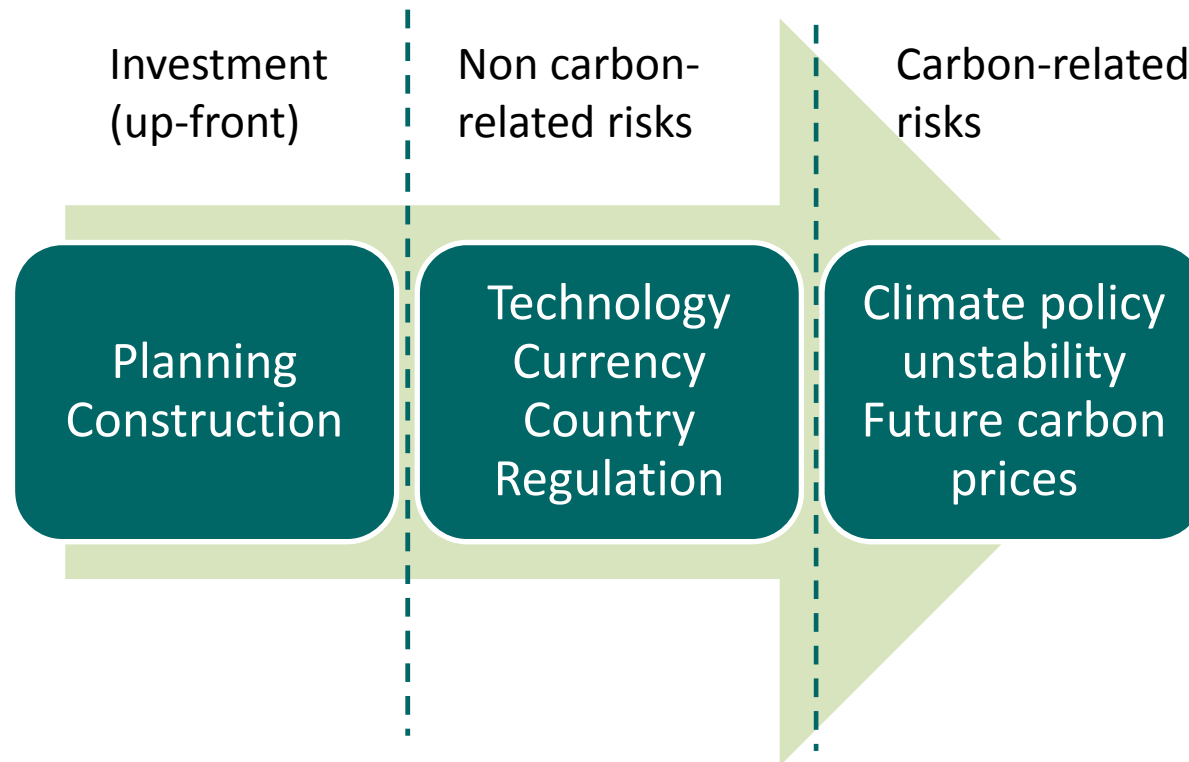
- Is the **funding gap too huge**? Some benchmarks
 - Norwegian sovereign funds: \$700b
 - China currency reserve: \$3200b
 - Net purchase of securities from offshore accounts in 2008: \$364b
 - Financial wealth in tax havens: \$5878b (Zucman, 2012)
 - Subsidies to fossil fuels: \$400b in 2010 (AIE, OCDE)
 - ECB's loan to the EU Banks in Feb 2012: \$500b
- Major imbalances of the global financial and monetary order => « **saving gluts** » (Zenghelis, 2011)
- Where to **invest** the money?



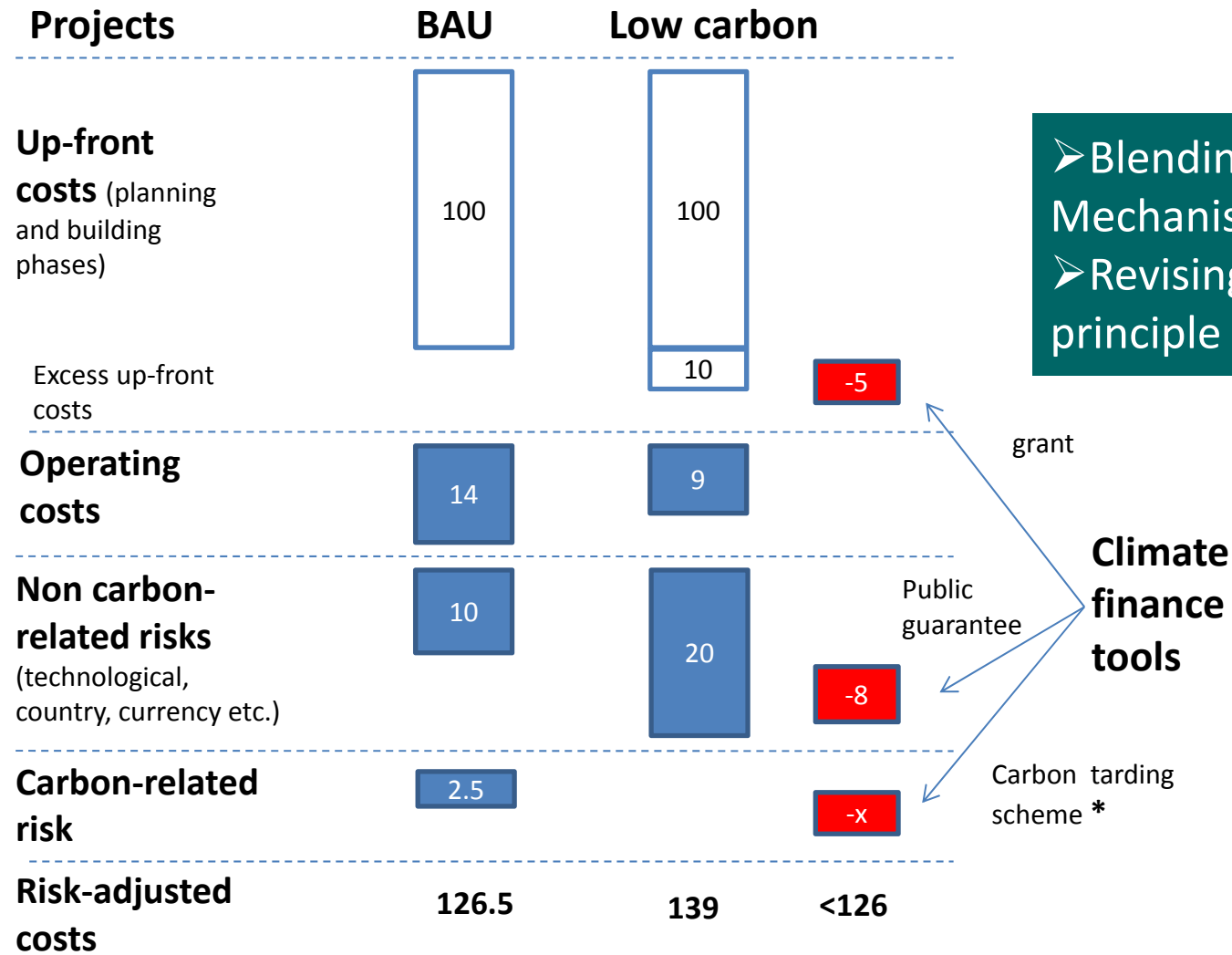
Solving the « Buridan's donkey » dilemma

The funding barriers: « excess-cost » due to high risk perception

Decomposition of risk perception of low-carbon projects



Reducing risk-adjusted costs of low-carbon projects



- Blending Public Finance Mechanisms tools
- Revising the additionality principle

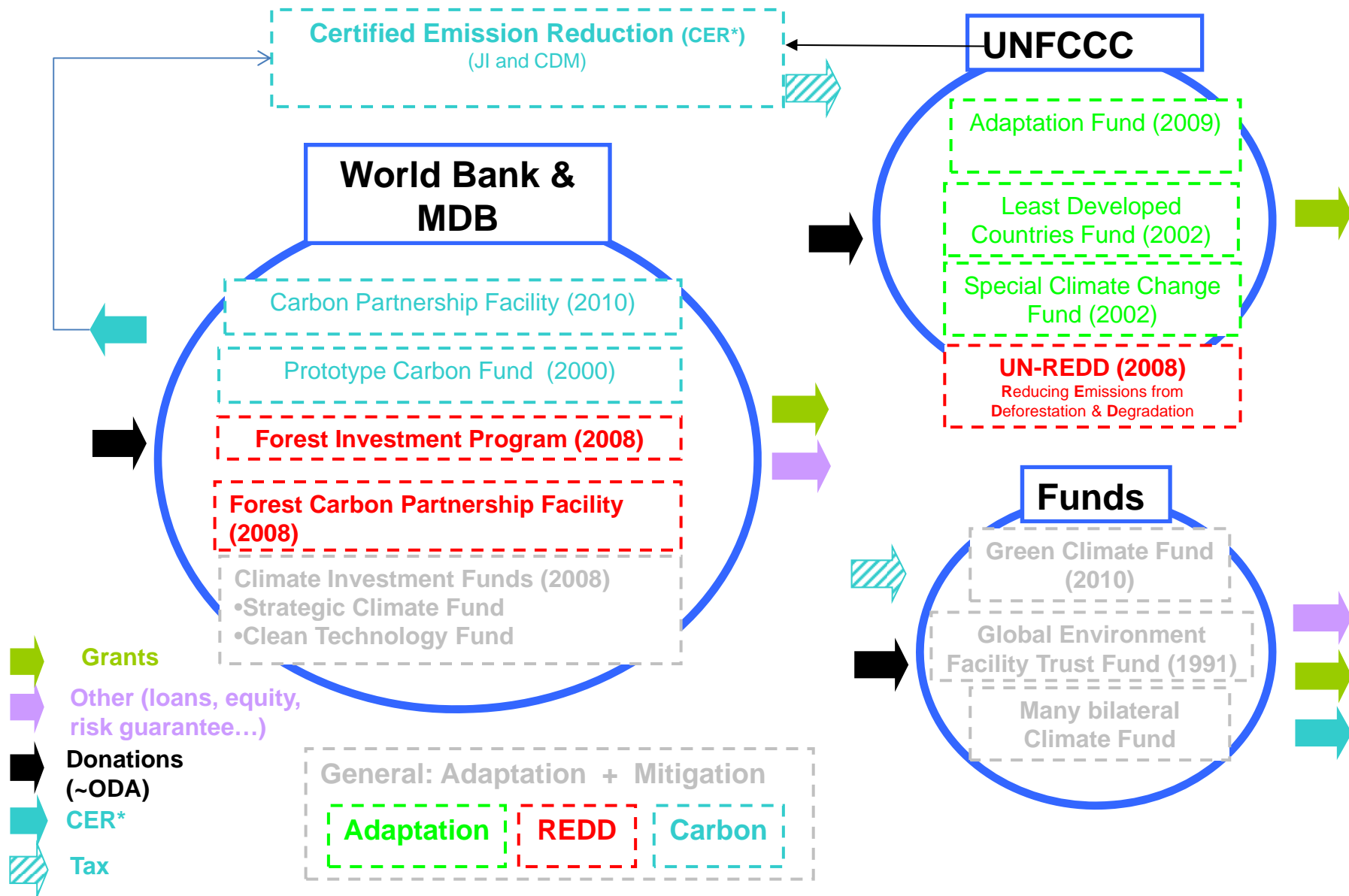
Climate finance tools

grant

Public guarantee

Carbon tarding scheme *

The actors of the climate finance galaxy



The existing tools

- Combination of **credit facilities** (from development agencies and commercial banks)
- **Conditional** financial **support** (\searrow policy and regulatory risks)
- **Green** credit lines (local scale)
- **Risk pooling** (climate funds)
- Technical and financial assistance to facilitate the access to **carbon markets**
- Public **guarantees** (concessional loans)

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The ABCs of CBAs

- Net present value: $NPV = \sum_{n=0}^N \frac{F_n}{(1+i)^n}$
with F_n the net cash flow at period n and i the actualisation rate.
- Internal rate of return (*IRR*): min r that verifies
$$\sum_{n=0}^N \frac{F_n}{(1+r)^n} \geq 0$$
- Payback period: min P such that $\sum_{n=0}^P \frac{F_n}{(1+r)^n} \geq 0$
- Return on investment
$$ROI = \frac{\textit{gain from investment} - \textit{cost of investment}}{\textit{cost of investment}}$$
- Return on equity:
$$ROE = \frac{\textit{net income (after tax)}}{\textit{shareholder equity}}$$

How to fund a portfolio of 10 LCPs?

Projet	IRR (%)	Size of the loan (\$10 ⁶)	Credit Rating	Default rate over 10 years (%)	Recovery rate	LGD (L*d*(1-R)) (\$10 ⁶)	Bp
1	20	100	AA	0,81	0,7	0,243	24,3
2	18	100	AA-	0,81	0,7	0,243	24,3
3	15	100	A+	0,93	0,5	0,465	46,5
4	12	100	A	1,86	0,5	0,93	93
5	10	100	A-	1,86	0,5	0,93	93
6	9	100	BBB+	2,9	0,3	2,03	203
7	8	100	BBB	5,5	0,3	3,85	385
8	7	100	BBB-	8,97	0,3	6,279	627,9
9	6	100	BB+	13,96	0,15	11,866	1186,6
10	5	100	BB+	13,96	0,15	11,866	1186,6
Total		1000				38,702	
Mean	11		BBB	5,156	0,41		387,02

Three funding instruments of a LCP portfolios

1. Each project asks for a loan to a bank
2. A climate fund issuing climate bonds is set up to mutualize fund raising
3. Risk pooling through a Collateralized Debt Obligation

The very limited channel of private loan or concessional loans

If the interest rate required by the bank is **15%** then ...

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Only three projects get funded!

The potential leverage of a public money invested in a climate fund



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If Paid-in-capital = \$10.10⁶
=> Six projects get funded!

If Paid-in-capital = \$38.10⁶
=> all projects get funded!

Leverage ratio = 26

The promise of risk pooling ... but unregulated CDOs have been key drivers of last crisis

Portfolio of projects

LCPs	Size of the loan (\$10 ⁶)	Bp
1	100	24,3
2	100	24,3
3	100	46,5
4	100	93
5	100	93
6	100	203
7	100	385
8	100	627,9
9	100	1186,6
10	100	1186,6
Total	1000	
Mean		387



Portfolio of financial products

CDO	Size of the tranche (\$10 ⁶)	Bp	
Senior (AAA)	320	10	Institutional Investors
Mezzanine (A)	300	93	
Mezzanine (BBB)	280	385	Investment Banks
Equity	100	2500	
Total	1000		Hedge Funds
Mean		389	

Loss allocation

If the CDO matches investors' risk profiles then all projects get funded

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In Search of An innovative proposal: some Food for Thought...

- *Hourcade J.C., Perrissin Fabert B. Rozenberg J.* Venturing into uncharted financial waters: an essay, on climate-friendly finance, ***International Environmental Agreements*** (2012) 12:165–186, DOI 10.1007/s10784-012-9169-y
- *Aglietta M., Hourcade J.C.* Can Indebted Europe Afford Climate Policy? Can It Bail Out Its Debt, ***Intereconomics*** , 2012/3
- *Hourcade J.C., Shukla P.* Triggering the low carbon transition in the aftermath of the global financial crisis, Forthcoming in ***Climate Policy***



Linking the climate challenge with the reform of the financial and monetary order

Terms of reference for the « wanted » device

1. **Surrogate of a « price signal »** to avoid the risk of fragmentation of climate finance



2. **Politically acceptable** in future climate negotiations



3. **↘ risk-adjusted perceived costs** of LCPs (= ↘ credit interest rate and leverage global **private savings**)



Successful scaling up of climate finance

The proposal: implementing a carbon-based « unconventional » monetary policy

- Scaling up climate finance through 2 channels:
 - Mobilizing the **banking sector**
 - Redirecting private saving toward low-carbon productive investments
- Carbon-based quantitative easing based on:
 - The issuance of **carbon certificates** by the Central Bank
 - Banking system **regulation** (reserves and capital requirements, Bâle III)
- Cornerstone of the architecture:
 - An international agreement on the **Social Cost of Carbon** (≠ carbon tax)

Sketching a Climate-Friendly Financial Architecture

I

- Deal on the « **Social Cost of Carbon** »
- SCC = notional value **≠ carbon tax!!!**

II

- Issuance of **CC**
- $CC = \alpha E [Abat_{CO_2}] \cdot SCC$

Central Bank	
Assets	Liabilities
Gold SDR Securities Carbon asset	Currency Banks' deposit CC deposits

Carbon
Certificates

Commercial and Development Banks	
Assets	Liabilities
<i>Legal reserves</i> - CC deposits - Cash <i>Loans</i> - «LCPs» loans	LCP-targeted financial products (Green Bonds)

Control Body
(UNFCCC?)

Monitoring
Reporting

Pool of Low-Carbon
Projects

Payback

\$

Loans

Returns

\$

Private Savings
(LCP-targeted assets)

Savings

Households Pension
Funds Lenders and
depositors
Sovereign Funds

III

- Verification of CO₂ ↘
- Recognition of CC as a **legal reserve asset**
- ↗ lending capacity of banks



Applied unilaterally or/and at a global level

An illustration of the accounting circuit of carbon-based assets

T₀ : Loan signature

$$CC = \alpha E_A [Abat_{CO_2}] \cdot SCC, \text{ with } SCC = \text{US\$ } 50/\text{tCO}_2$$

Government



Investment and Development Banks	
Assets	Liabilities
Legal reserves +\$ 0	A _{LCP} deposits \$ 1000
Loan A _{LCP} \$ 1000	6 CC * 50 = \$ 300
6 CC * 50 = \$ 300	

Project A _{LCP}	
Assets	Liabilities
Cash \$ 1000	Debt \$ 1000
CC balance 6 CC * 50 = \$ 300	Carbon Debt 6 CC * 50 = \$ 300

T₁ : Start of Operation phase

Central Bank	
Assets	Liabilities
Social Carbon Asset (based on the SCC)	Bank's deposit +\$ 150

Investment and Development Banks	
Assets	Liabilities
Legal reserves +3 CC = \$ 150	A _{LCP} deposits \$
Loan A _{LCP} \$ 1000	3 CC * 50 = \$ 150
3 CC * 50 = \$ 150	

Project A _{LCP}	
Assets	Liabilities
Equipment \$ 1000	Debt \$ 1000
CC balance 3 CC * 50 = \$ 150	Carbon Debt 3 CC * 50 = \$ 150

T₂ : Payback period

Central Bank	
Assets	Liabilities
Social Carbon Asset (based on the SCC)	Bank's deposit +\$ 200

Investment and Development Banks	
Assets	Liabilities
Legal reserves +4 CC = \$ 200	A _{LCP} deposits \$
Loan A _{LCP} \$ 500	2 CC * 50 = \$ 100
2 CC * 50 = \$ 100	

Project A _{LCP}	
Assets	Liabilities
Equipment \$ 1000 – depreciation	Debt \$ 500
CC balance 2 CC * 50 = \$ 100	Carbon Debt 2 CC * 50 = \$ 100

T₃ : End of payback period

Central Bank	
Assets	Liabilities
Social Carbon Asset (based on the SCC)	Bank's deposit +\$ 300

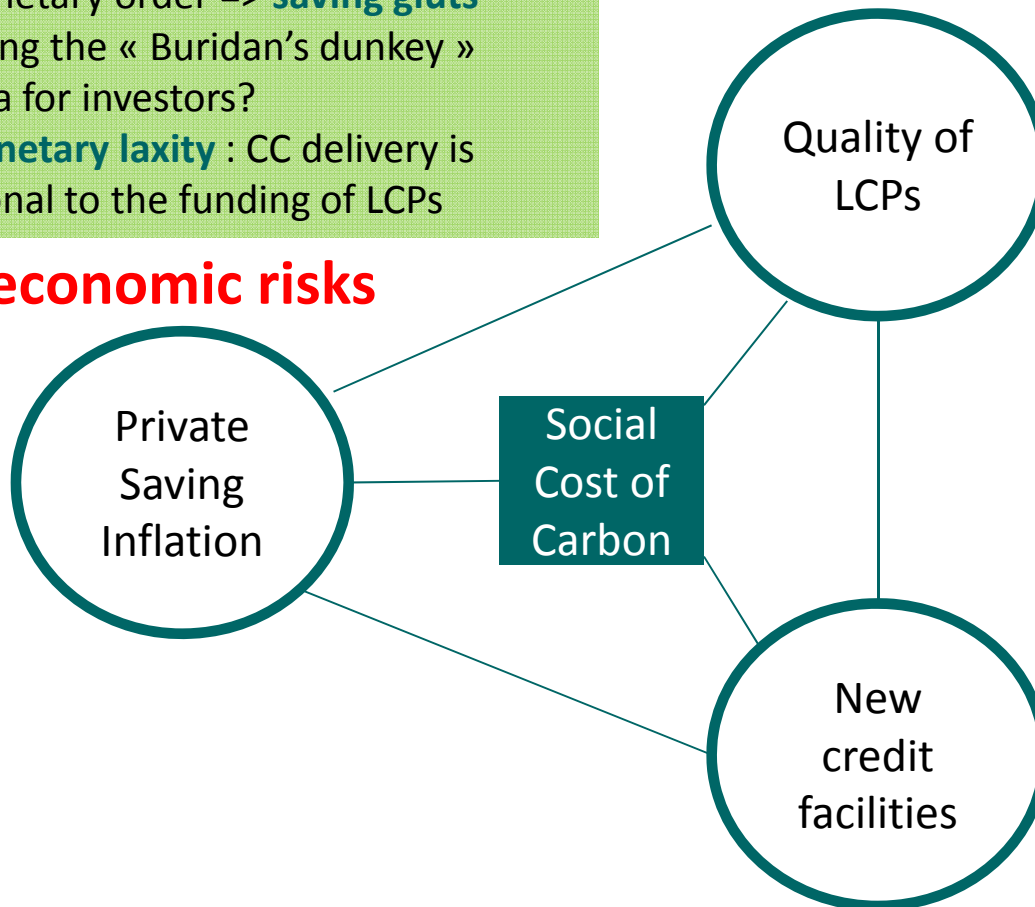
Investment and Development Banks	
Assets	Liabilities
Legal reserves +6 CC = \$ 300	A _{LCP} deposits \$ 0 CC
Loan A _{LCP} \$ 0	
0 CC	

Project A _{LCP}	
Assets	Liabilities
Equipment \$ 1000 – depreciation	Debt \$ 0
CC balance 0	Carbon Debt 0

A carbon-based money (or debt) issuance with three main risks?

- Major imbalances of the global financial and monetary order => **saving gluts**
- Resolving the « Buridan's donkey » dilemma for investors?
- No monetary laxity** : CC delivery is conditional to the funding of LCPs

Macroeconomic risks



Environmental risk

- Taking stock of **CDM experience**
- From « project-based » additionality to « **statistical** » additionality

Regulation risk



No magic bullet ! A climate-friendly financial device to redirect part of (misused) savings toward a « green growth » recovery

The scaling up of climate finance as part of the European « growth compact »

- Call for **budget rigor** within the **fiscal compact** but...
 - *The more the debtors pay, the more they owe* (I. Fisher, Econometrica 1933)
 - Bailout of european banks (injection of **€ 1 trillion** at 1%) to avoid credit crunch
 - **Interest rate almost <0** for less risky countries => the « buridan's dunkey » is still hesitating...
- The need for **a « new frontier »** for investors
 - **European Green Fund** (managed by EIB) issuing carbon-based eurobonds, or project-bonds
 - A plan for **a green re-industrialization** (energy, transport, housing, materials)

Four global co-benefits of a financial architecture based on an international carbon-based reserve asset

- Wave of « **green growth** » recovery
- More **inward-oriented growth** in emerging economies
- Calming current **tensions about currencies** if scaled-up at the global level (green SDR?)
- Fostering the conclusion of an **ambitious agreement** within future climate negotiations

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