



Leakage with Forestry and Agriculture Offsets: What do we really know?

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What is Leakage?

- Efforts targeted to reduce emissions in one place simply shift emissions to another location or sector ***where they remain uncontrolled or uncounted.***
- Types
 - International: shifting from an uncapped country to a capped country
 - Subnational:
 - Shifting from a capped source to an uncapped source
 - Shifting from an offset project
 - to a source in the same uncapped sector
 - to a source in another uncapped sector



Why do we care about leakage?

- Erodes the GHG benefits/offset value of a project
- Can be difficult to measure
- Difficult to enforce due to incomplete contracts
- Potential to undermine a project-based offset system



Why Leakage Occurs

- **Leakage occurs ...**
 - “whenever the spatial scale of the intervention is inferior to the full scale of the targeted problem” (Wunder 2008)
 - Rules, regulations, and incentives for action affect only part of the potential participants or emissions sources
- **Economic forces:** Supply/demand supplanted by the project is met elsewhere
 - Formal markets
 - Other institutional arrangements



Leakage in forestry and agriculture projects

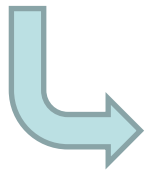
- Leakage is **not unique to forest and agriculture projects**
- But, features of forestry and agriculture make them **susceptible**
 - Fixed land base: Land use change has spillover effects
 - Commodity markets are often broad in scope (regional, national, global)



Example



Afforestation project: agricultural land



Deforestation elsewhere to clear land
For agriculture





What do we know?





Does leakage really exist?

Ex post analysis of other land-based policies

- ✓ **Wear and Murray (2004)**
 - ✓ **Evidence: Net effects of federal timber harvests in Pacific Northwest.**
 - ✓ **Harvests elsewhere offset reductions by 84%**
 - ✓ **Denominated in timber, not carbon**
- ✓ **Wu (2002) and Roberts and Bucholtz (2005) – CRP program slippage**

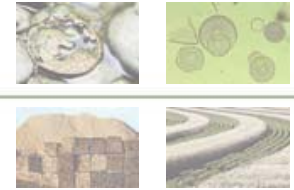
328 D. N. Wear, B.C. Murray / *Journal of Environmental Economics and Management* 47 (2004) 307–330

Table 8
Leakage effects^a

Public harvest timber reductions		
West coast	1200.4	
Inland west	866.8	
Total west	2067.2	
Induced harvests elsewhere		Percent leakage ^b
Western private lands	894.6	43.3%
South	298.9	
US total	1193.5	57.7%
Canada	550.4	
North America total	1744.0	84.4%

^a All quantities are in million board feet, timber scale (1990–1995 annual average).

^b Leakage = Induced harvest in area *i* divided by total west public harvest reduction.



Predictive Estimates: Regional US Forest Carbon Programs

Program targeted at specific activities by region

120

Land Economics

February 2004

TABLE 2

Avoided Deforestation Leakage Results
(All Quantities Are Percentages)

Region	No Harvesting Allowed	Harvesting Allowed
Pacific Northwest—		
East Side	8.9	7.9
Northeast	43.1	41.4
Lake States	92.2	73.4
Corn Belt	31.5	-4.4
South-Central	28.8	21.3

TABLE 3

Afforestation Program Leakage Estimates by
Region (All Quantities Are Percentages)

Region	Leakage Estimate (%)
Northeast	23.2
Lake States	18.3
Corn Belt	30.2
Southeast	40.6
South-Central	42.5



Predictive Estimates: National-scale Programs

Table 6-2: Leakage Estimates by Mitigation Activity at a GHG Price of \$15/t CO₂ Eq.

All quantities are on an annualized basis for the time period 2010–2110.

Selected Mitigation Activities	A GHG Effects of Targeted Payment (Tg CO ₂ Eq.)	B Net GHG Effects of All Activities (Tg CO ₂ Eq.)	C Indirect GHG Effects from Nontargeted Activity ^a (Tg CO ₂ Eq.)	D Leakage Rate ^b (%)
Afforestation only	137	104	-33	24.0
Afforestation + forest management	338	348	10	-2.8
Biofuels	84	83	-1	0.2
Agricultural management	230	231	1	-0.1
Agricultural soil carbon	154	145	-9	5.7

^a Indirect effects: C = (B - A).
^b Leakage rate: D = -(C/A) x 100; rounding occurs in table.

Note: Negative leakage rate in D refers to beneficial leakage (i.e., additional mitigation outside the selected activity region, also called positive leakage).



Leakage Myths

- **Leakage is the same as “activity shifting”**
 - Only if it causes the emissions to shift outside of the accounting/policy boundaries
- **All leakage is bad**
 - You can get positive spillover effects (but they seem rarer)
- **Leakage does not occur if projects are too small to affect the market price**
 - Other way around
 - Small projects don't affect market price because of leakage
 - there are a lot of other market participants who can replace the project's contribution to the market without disruption



What we do not know?

- Where leakage is actually happening
 - Leakage cannot be directly observed, only estimated and inferred
 - Not a simple “before/after” inference
 - Like additionality, it is tied to a baseline
 - Emissions induced beyond BAU
 - Makes leakage management difficult
- A general precise prediction of its magnitude
 - Ranges from 0 – 90%+ depending on activity, location, program design, etc...



What can we do about leakage?

- **Manage locally**
 - Improve monitoring
 - Minimize through project design
- **Discount projects for it**
 - Estimate leakage (e.g., econometrically)/hold back credits
 - No discounts if participation is sufficient
- **Systemwide accounting**
 - Expand the scale and scope of accounting to sector/national level
 - **System-wide true-up**
- **Adjust the cap**
 - **Tighten to make up for leakage**
 - Expand the cap to include more uncapped sectors
- **Forgive and Forget**
 - Ignore the leakage
- **Decouple from compliance system**
 - Exclude offset compensation from GHG target compliance



Up until now, focus has been
on discounts based on
predictive leakage estimates





Another Way I: Systemwide True-up

- Set aside a leakage buffer for offsets
- Measure net changes nationally
- Reconcile project and national accounts
- Challenge:
 - Separating out leakage from natural variation of carbon in the system
 - Work in progress



Another Way II: Deal Indirectly – Tighten the Cap

- **Quantify it and adjust cap accordingly**
 - Essentially shifts the burden back to the capped sectors (explicitly)
- **Retrospectively**
 - Like with system true-up
- **Prospectively**
 - Based on predictive leakage estimates
- **Challenges**
 - Empirical
 - Political



Questions?

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