

# Assessing the Climate Change Mitigation Potential of Canada's Forest Sector

---

**CFS CAT:** Graham Stinson, Mark Hafer, Carolyn Smyth, Eric Neilson, Gary Zhang, Max Fellows, Michael Magnan, and Werner Kurz

**CFS EAD:** Emina Krcmar, Alison Beatch, Greg Rampley, and Tony Lemprière

**National Forest Sinks Committee**

Project funded by:  
Natural Resources Canada, Canadian Forest Service,  
Leadership for Environmental Advantage in Forestry,  
Panel on Energy Research and Development,  
and in-kind contributions by provincial and territorial governments

GHG Modeling Forum  
Shepherdstown, West Virginia  
Sept 27, 2011



Natural Resources  
Canada

Ressources naturelles  
Canada

Canada

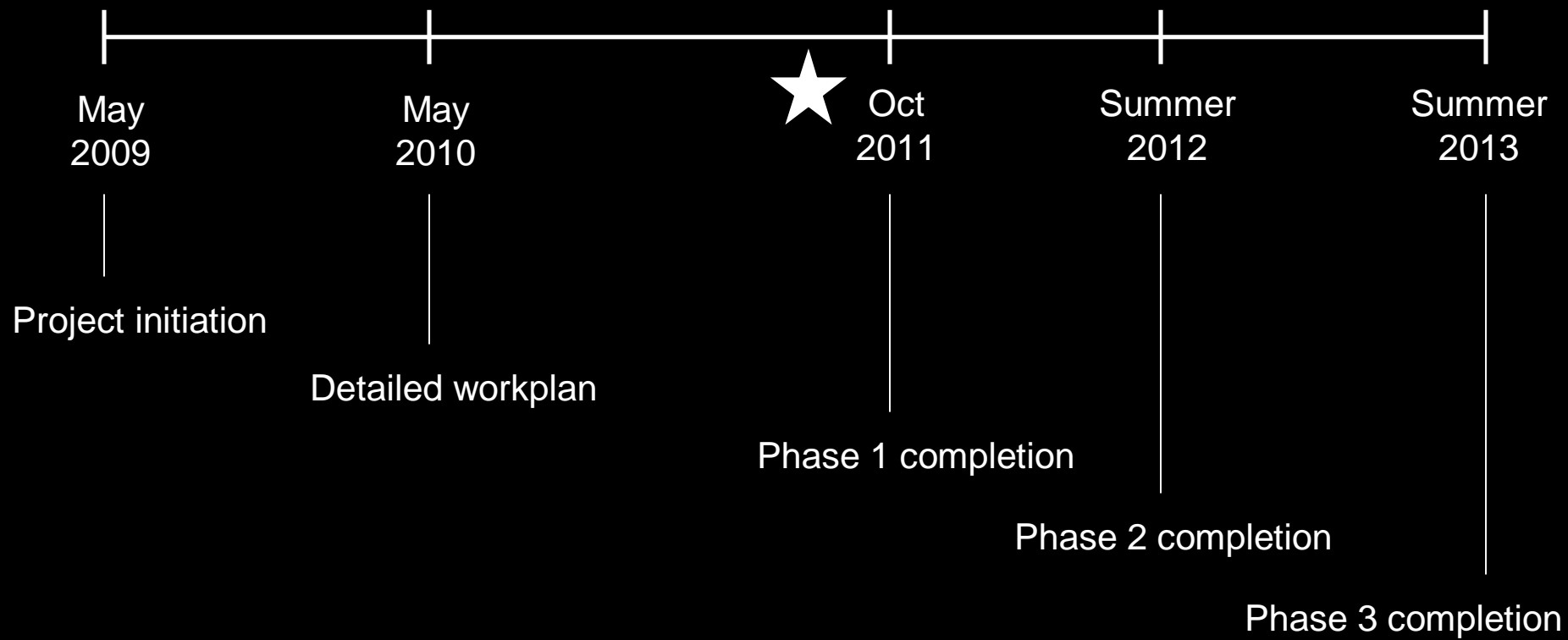
## **Study Questions:**

- How much could the forest sector contribute to Canadian GHG emission reduction targets?
- At what cost, and how does this compare with other sectors?
- Which strategies will be most effective, when and where?
- Which will be most appropriate given other forest values and resource management objectives?

## **Scope:**

- Mitigation involving managed forests and harvested wood
- Analysis at national and provincial/territorial scales
- Not examining mitigation involving mill operations, afforestation or reducing deforestation

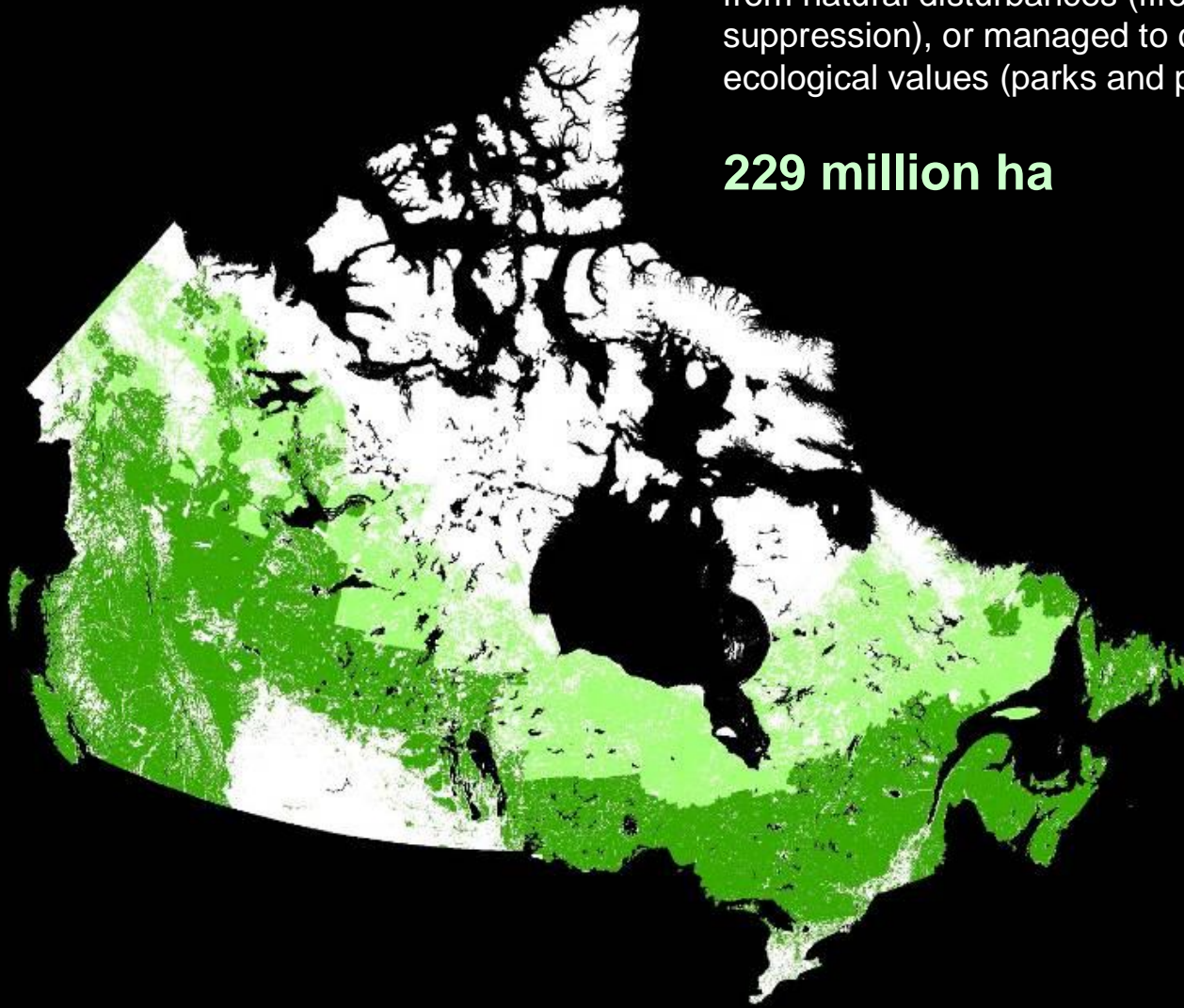
# Workplan



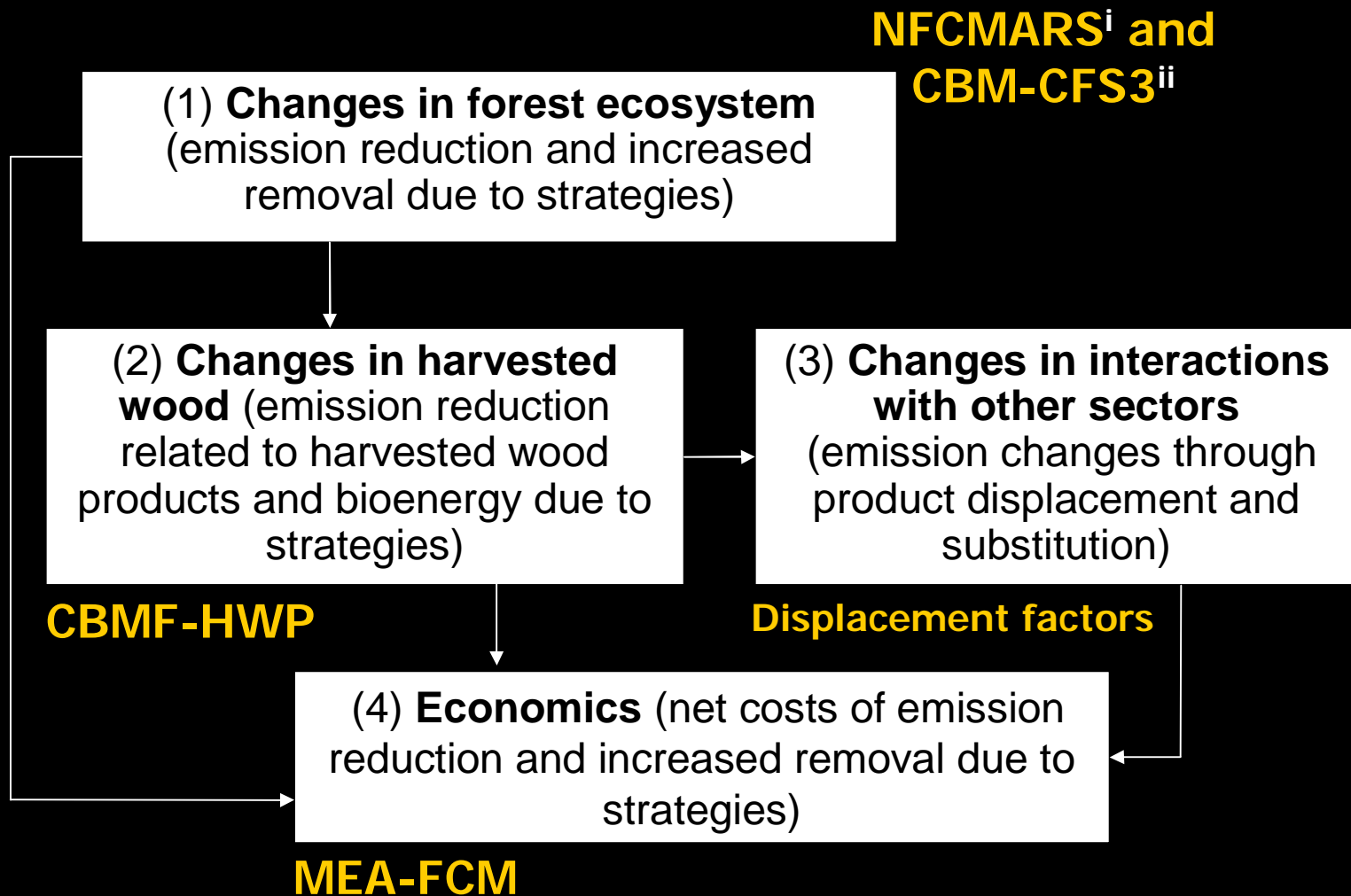
## The managed forest

Forest managed for wood fibre, under protection from natural disturbances (fire or insect suppression), or managed to conserve forest ecological values (parks and protected areas)

**229 million ha**



# Analytical Framework



<sup>i</sup> Stinson et al. (2011) *Global Change Biology* 17, 2227-2244

<sup>ii</sup> Kurz et al. (2009) *Ecological Modelling* 220, 480-504

# Mitigation Strategies Examined

---

## Forest Management (FM):

- **FM1:** carbon smart harvest – increased fibre recovery (utilization, salvage, slash recovery in place of burning)
- **FM2:** harvest less – reduce harvest levels for conservation
- **FM3:** bioenergy harvest – increased harvest for bioenergy

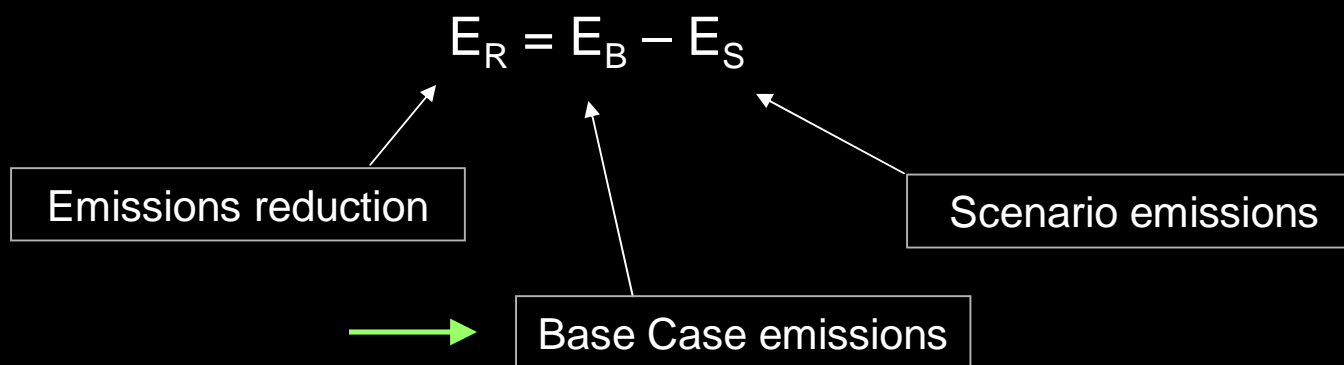
## Harvested Wood Products (HWP):

- **HWP1:** wood substitution – more harvest goes to long lived products
- **HWP2:** bioenergy substitution – more harvest goes to bioenergy

- Developed in consultation with forest management agencies from across Canada, implementation level varies.

# Evaluation relative to Base Case

**Mitigation** = emission reductions from incremental activity, starting in 2012

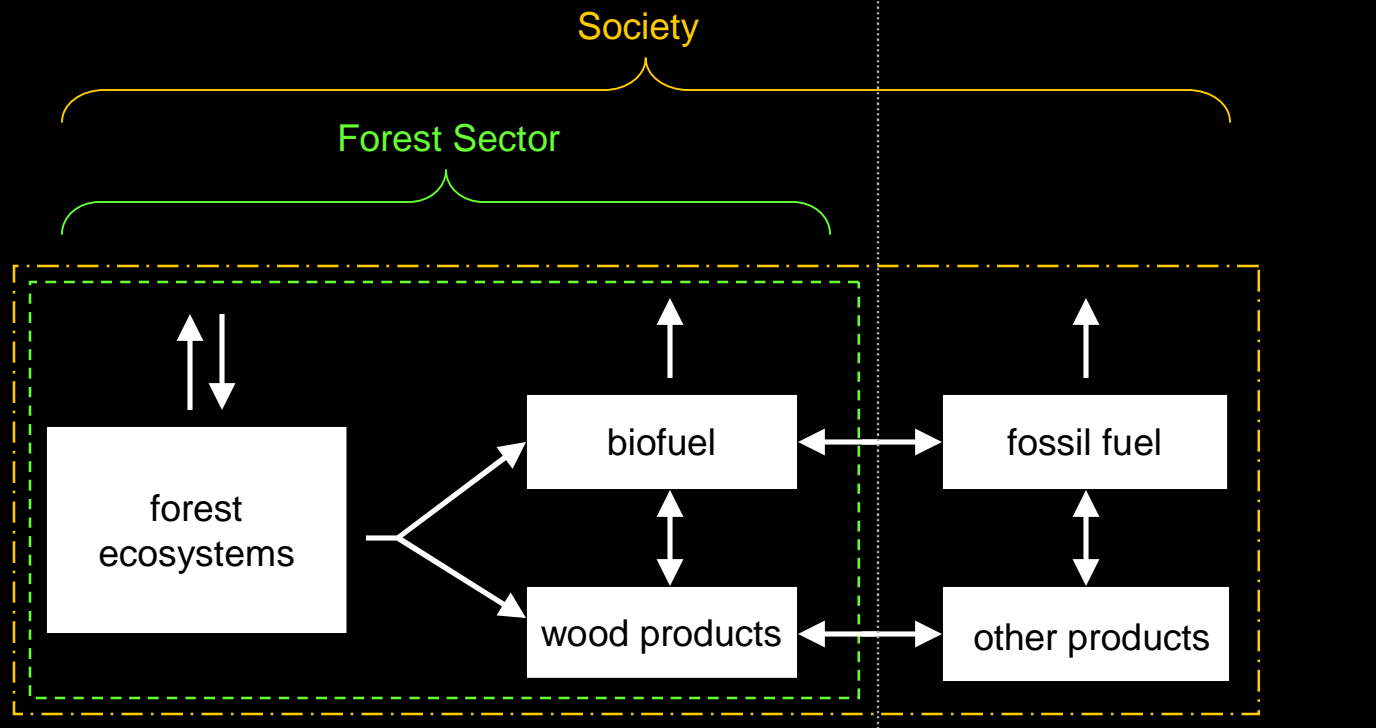


- Calculated using same data and parameters as used in NFCMARS & CBM-CFS3 for national GHG inventory reporting, with some exceptions
- Calculated using estimates of HWP emissions as they occur
- Same harvest projection as used in Canada's proposed (March 2011) FM reference level in the international negotiations

# Sector vs. Society Emission Reductions

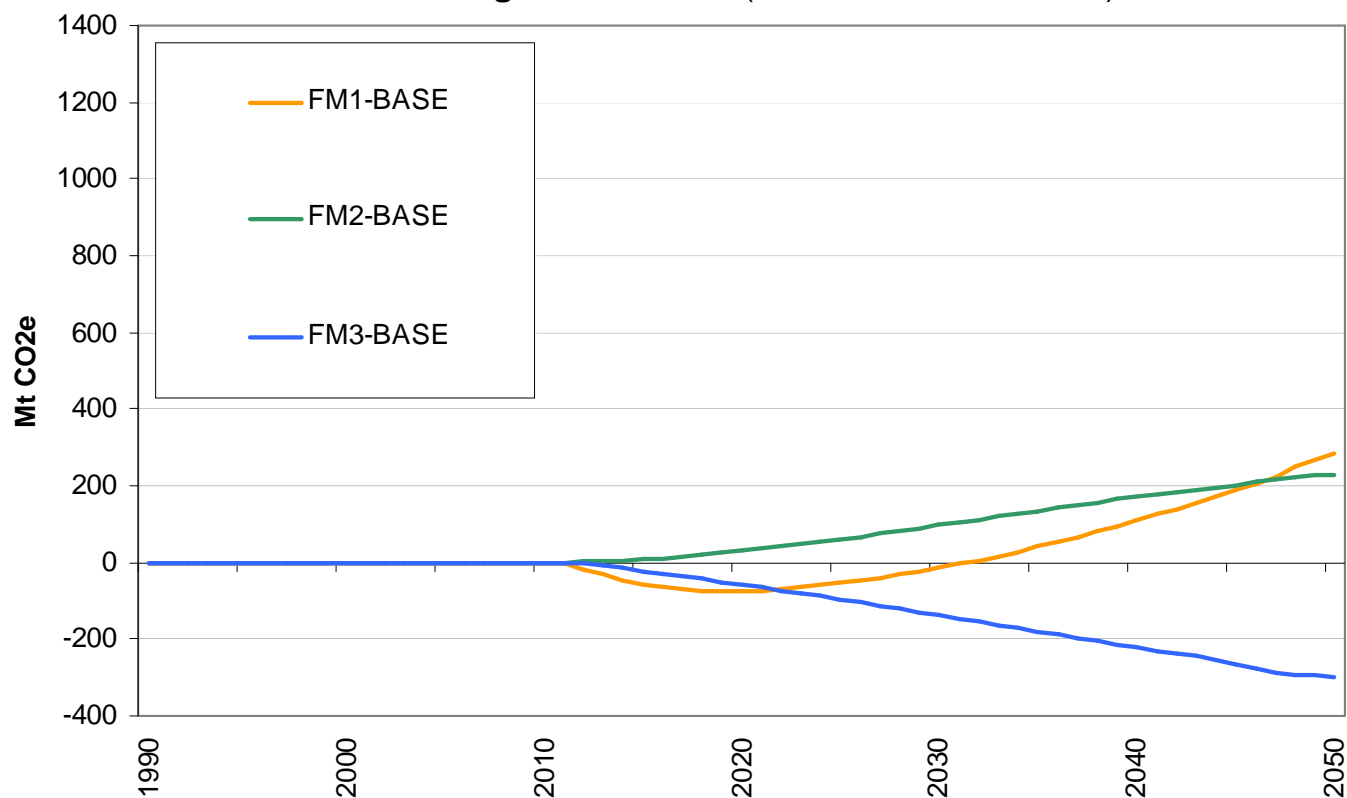
- **Sector** = Forest + Products
- **Society** = Sector + Displacement

Displacement:  
*GHG emissions avoided when wood is used instead of some other material*





### Sector's mitigation realized (relative to BASE-BASE)



**Sector's mitigation**

= Forest + Products

Emissions  
reduction



Increased  
emissions

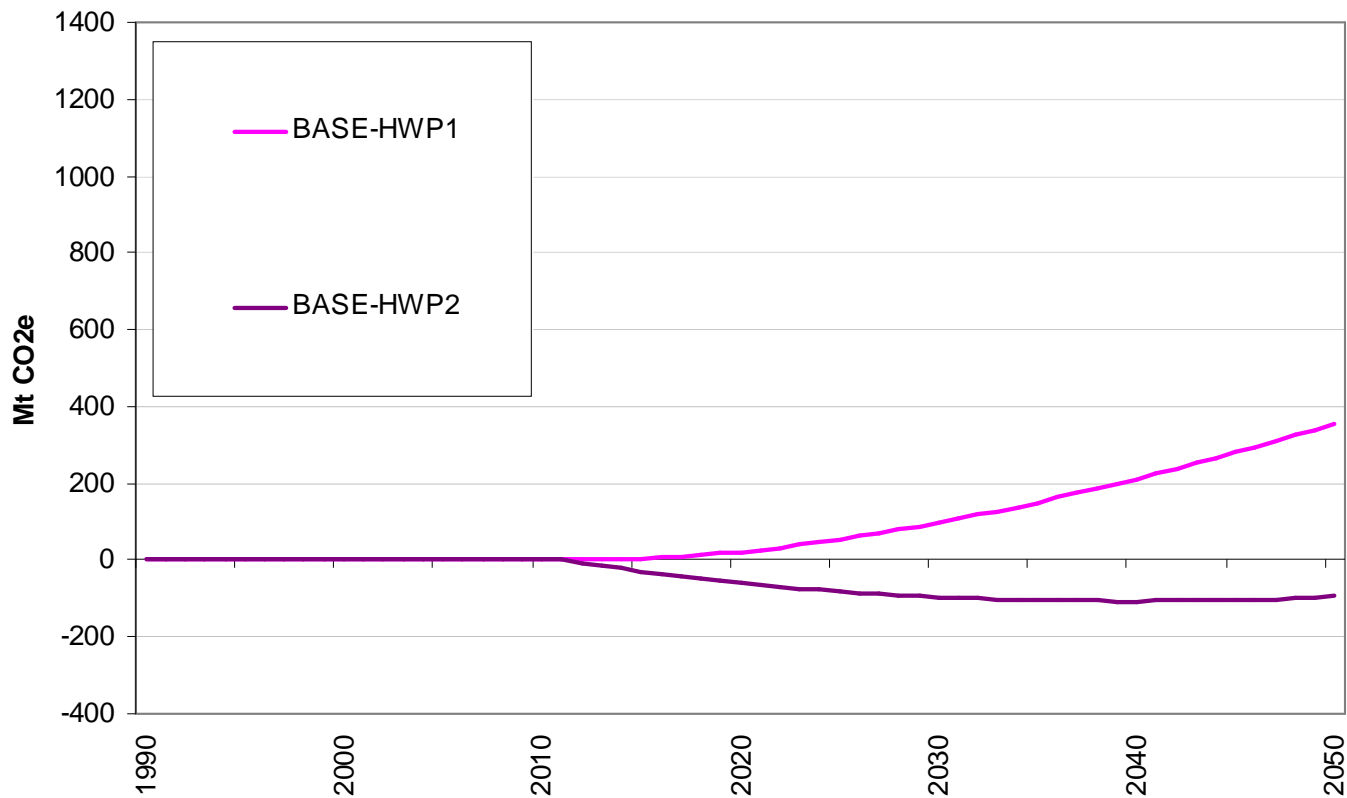
#### **Key findings:**

*Enhanced mitigation* realized by carbon smart harvesting (FM1) or harvesting less (FM2)

*Reduced mitigation* at the national scale when harvesting live trees for bioenergy (FM3) but local opportunities are expected to exist that we don't see in the national result

FM1 = increased utilization and recovery  
FM2 = reduced area for harvest with reduced harvest  
FM3 = increased harvest for bioenergy  
HWP1 = increased production of long-lived products  
HWP2 = increased production of bioenergy

### Sector's mitigation realized (relative to BASE-BASE)



**Sector's mitigation**

= Forest + Products

Emissions  
reduction



Increased  
emissions

#### Key findings:

*Enhanced mitigation* realized by increasing longevity of product mix (HWP1)

*Reduced mitigation* when displacing wood and paper production with bioenergy production (HWP2) – keeping in mind that sector's mitigation does not include displacement

FM1 = increased utilization and recovery

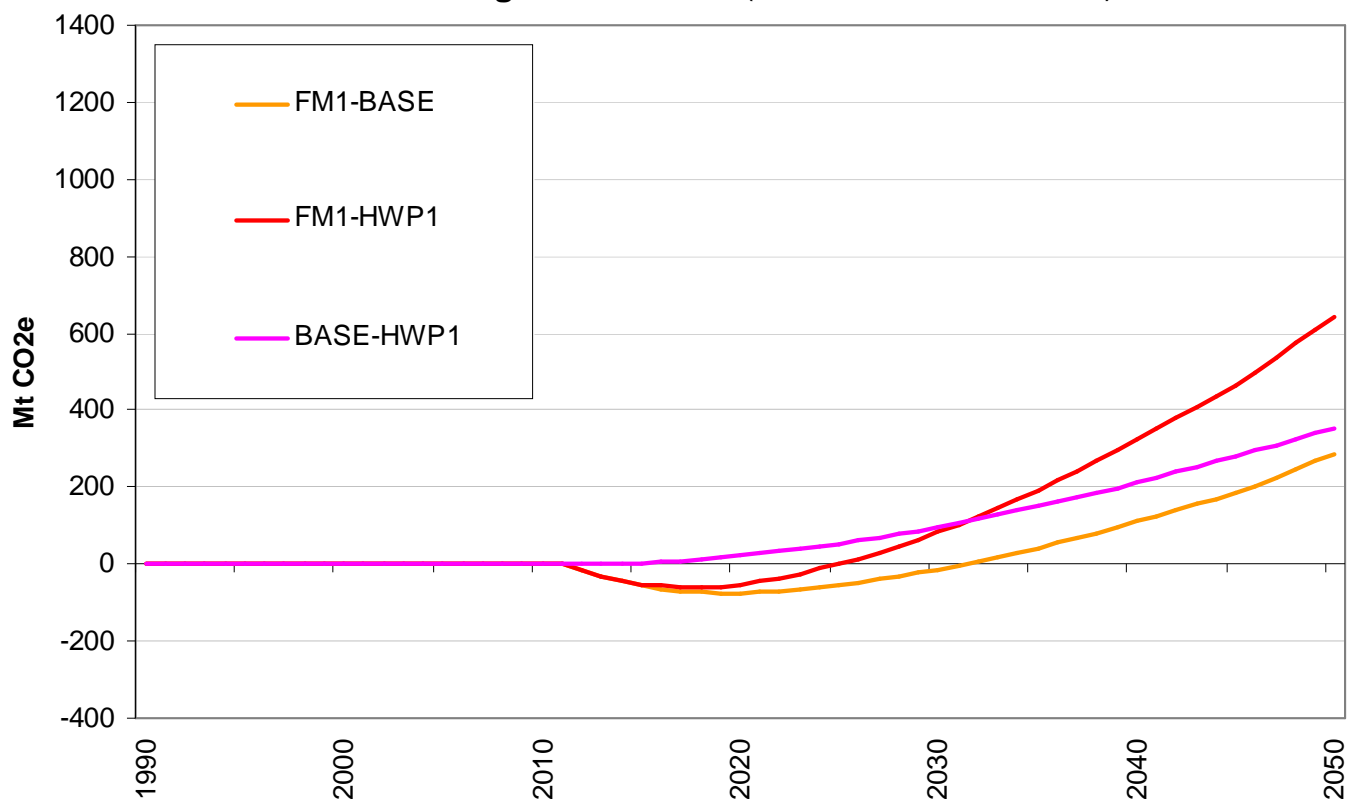
FM2 = reduced area for harvest with reduced harvest

FM3 = increased harvest for bioenergy

HWP1 = increased production of long-lived products

HWP2 = increased production of bioenergy

### Sector's mitigation realized (relative to BASE-BASE)



**Sector's mitigation**

= Forest + Products

Emissions  
reduction



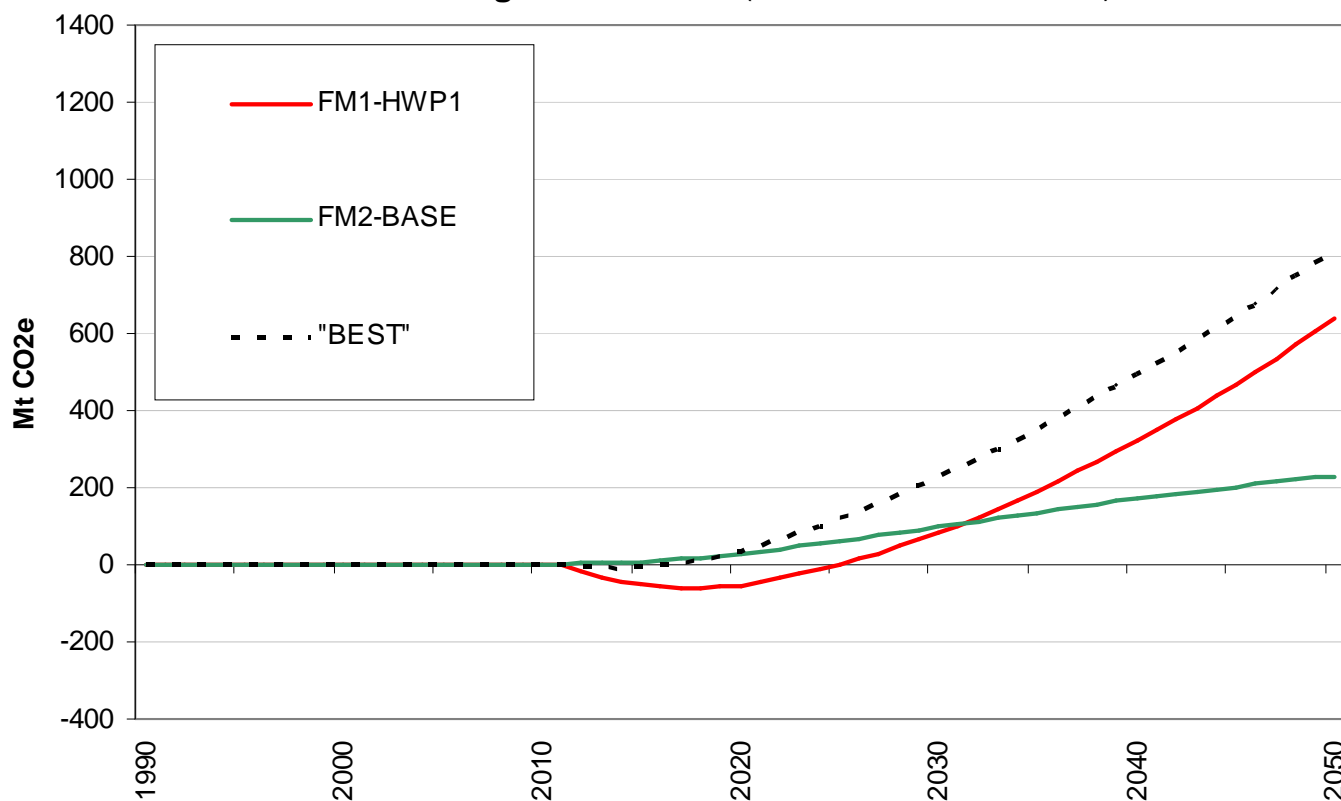
Increased  
emissions

#### Key findings:

Enhanced mitigation by combining forest management and product management mitigation strategies

FM1 = increased utilization and recovery  
 FM2 = reduced area for harvest with reduced harvest  
 FM3 = increased harvest for bioenergy  
 HWP1 = increased production of long-lived products  
 HWP2 = increased production of bioenergy

### Sector's mitigation realized (relative to BASE-BASE)



**Sector's mitigation**

= Forest + Products

Emissions  
reduction



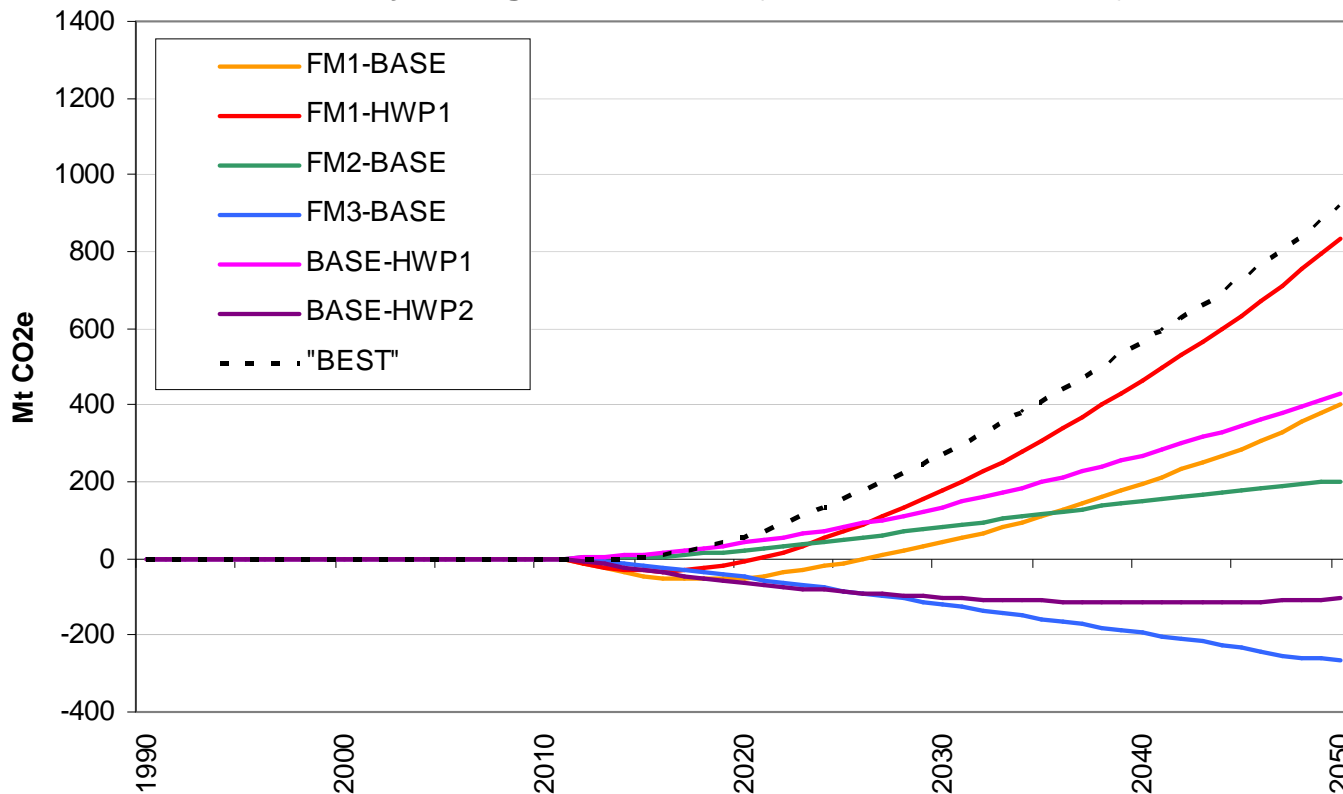
Increased  
emissions

#### Key findings:

Enhance mitigation through portfolio mix of strategies

FM1 = increased utilization and recovery  
FM2 = reduced area for harvest with reduced harvest  
FM3 = increased harvest for bioenergy  
HWP1 = increased production of long-lived products  
HWP2 = increased production of bioenergy

### Society's mitigation realized (relative to BASE-BASE)



### Society's mitigation

= Sector + Displacement

Emissions reduction



**Displacement:**  
GHG emissions avoided when wood is used instead of some other material



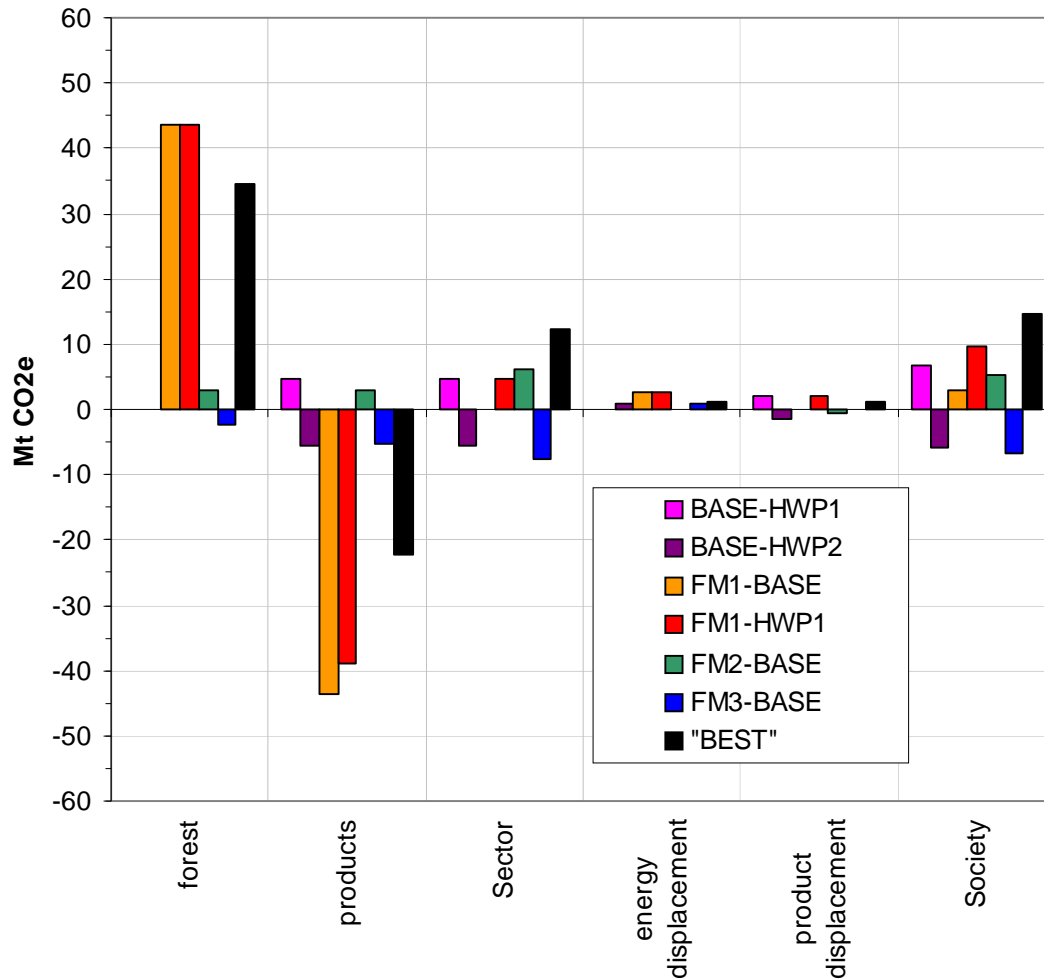
Increased emissions

### Key findings relative to sector analysis:

Some mitigation benefits from forest management and bioenergy strategies occur outside the forest sector (displacement) but these only accumulate gradually over time, and our study period is shorter than the typical Canadian harvest rotation

FM1 = increased utilization and recovery  
 FM2 = reduced area for harvest with reduced harvest  
 FM3 = increased harvest for bioenergy  
 HWP1 = increased production of long-lived products  
 HWP2 = increased production of bioenergy

# Mitigation in 2020



Emissions reduction



Increased emissions



## Key findings:

Strategies that maximize carbon storage in the forest are not the best strategies overall

Incremental emissions displacement by forest sector mitigation activities generally small in the short term

Portfolio mix of strategies provides greatest mitigation impact

- FM1 = increased utilization and recovery
- FM2 = reduced area for harvest with reduced harvest
- FM3 = increased harvest for bioenergy
- HWP1 = increased production of long-lived products
- HWP2 = increased production of bioenergy

# Key Messages

---

- 1) Many forest management strategy options available for climate change mitigation
- 2) Strategies that maximize carbon storage in the forest are not the best strategies overall
- 3) Some bioenergy strategies more effective than others

Mitigation realized by capturing harvest residues for bioenergy instead of slash burning

No mitigation realized at the national level in the time period analyzed by harvesting live trees for bioenergy, but local-level opportunities are expected to exist

- 4) Some good long term strategies **increase** short term emissions
- 5) Greatest mitigation impact will be realized through careful mitigation portfolio development