

## Forested Lands and Wood Products Biodegradable Carbon Emissions & Sinks (MMTCO<sub>2</sub>)

Category [Data Source]	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
<b>Sinks</b>															
<b>Forested Lands Removals</b>															
Forest woody biomass growth [1]	-13.141	-13.118	-13.096	-13.074	-13.052	-13.052	-13.052	-13.052	-13.052	-13.052	-13.052	-13.042	-13.032	-13.022	-13.012
Rangeland woody biomass growth [1]	-1.104	-1.102	-1.100	-1.099	-1.097	-1.097	-1.097	-1.097	-1.097	-1.097	-1.097	-1.096	-1.095	-1.094	-1.093
<b>Total Sinks</b>	-14.245	-14.221	-14.197	-14.172	-14.148	-14.148	-14.148	-14.148	-14.148	-14.148	-14.148	-14.137	-14.127	-14.116	-14.105
<b>Emissions</b>															
<b>Forested Lands Emissions</b>															
Forest and rangeland fires [1]	2.032	2.028	2.025	2.022	2.018	2.018	2.018	2.018	2.018	2.018	2.018	2.017	2.015	2.014	2.012
Other disturbances[1]	1.208	1.206	1.204	1.202	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.199	1.198	1.197	1.196
Development of forest or range lands (Landuse change) [1]	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
Timber harvest slash [1]	0.156	0.156	0.156	0.156	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155	0.155
<b>Wood Products Emissions</b>															
Fuel wood [1]	1.532	1.529	1.526	1.524	1.521	1.521	1.521	1.521	1.521	1.521	1.521	1.520	1.519	1.518	1.517
Wood waste dumps [2]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Discarded wood and paper in landfills [3]	2.350	2.438	2.577	2.815	2.988	3.170	3.268	3.261	3.392	3.357	3.469	3.655	3.779	3.746	3.740
Composting of wood waste materials [2]	0.255	0.305	0.354	0.403	0.451	0.500	0.549	0.597	0.646	0.694	0.743	0.743	0.745	0.800	0.803
<b>Total Emissions</b>	7.555	7.683	7.863	8.142	8.355	8.586	8.733	8.774	8.953	8.967	9.127	9.310	9.432	9.450	9.444
<b>Net CO<sub>2</sub> Flux</b>															
<b>Net CO<sub>2</sub> Flux</b>	-6.690	-6.537	-6.333	-6.030	-5.793	-5.563	-5.415	-5.374	-5.195	-5.181	-5.021	-4.827	-4.695	-4.666	-4.662

**Data sources:**

[1] – Winrock report: CEC (2004). Baseline Greenhouse Gas Emissions for Forest, Range, and Agricultural Lands in California. CEC PIER final report CEC-500-04-069F. Annual average forest and range land CO<sub>2</sub> removal and emission rates for period 1994 - 2000 in Table 1-21, CEC (2004) scaled to state-wide in CEC (2006): Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004. Publication CEC-600-2006-013-SF. Emissions and removals are back-cast to 1990 from 1994 using 0.1707 percent per year forest land area trend from 1953 to 1994, from p. 14 in Shih (1998): The Land Base of California's Forests. Fire and Resource Assessment Program, California Dept. of Forestry and Fire Protection. Emissions and removals forecasted from 2000 using 4 percent forest land area decline predicted for 1997 to 2050 in the Pacific Coast Region, from p. 53 in: Area Changes for Forest Cover Types in the United States, 1952 to 1997, with projections to 2050. (2004) USDA Forest Service, Pacific Northwest Research Station, publication PNW-GTR-613.

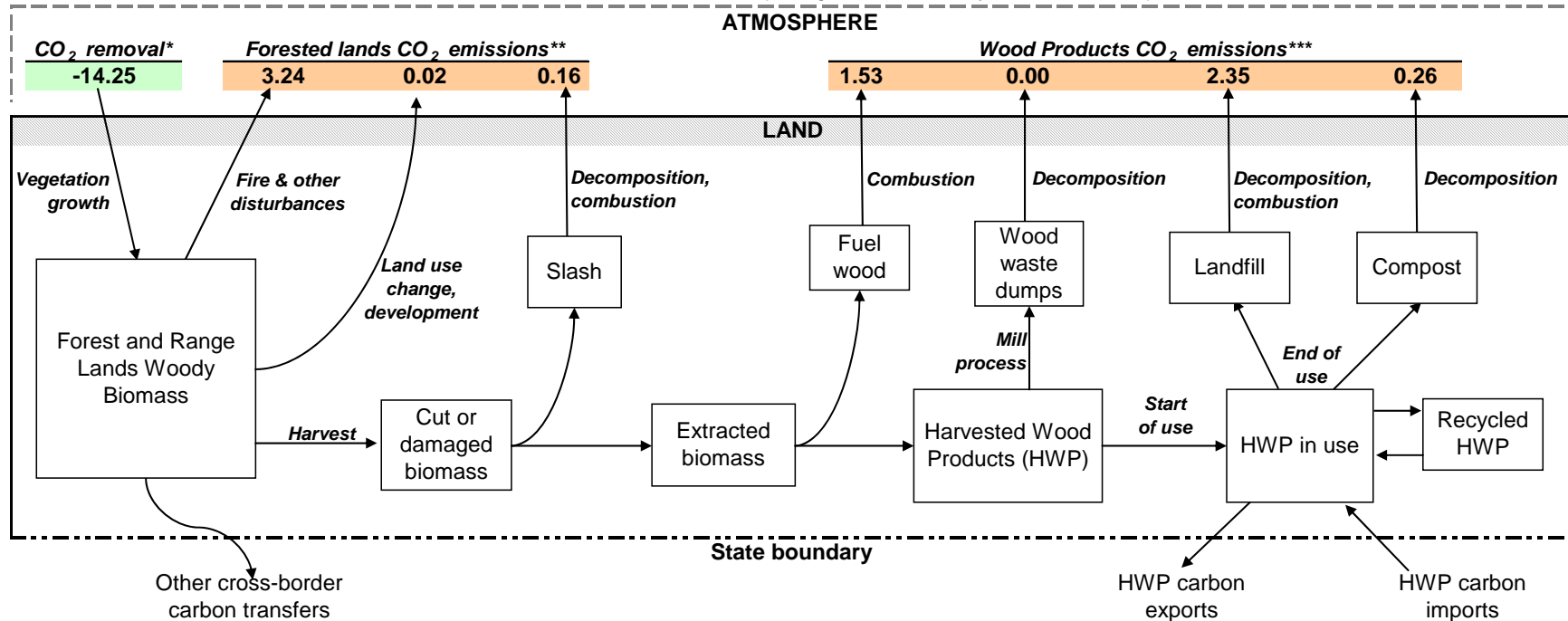
[2] - CIWMB/USEPA: California Integrated Waste Management Board SWIS waste-in-place and landfill survey data, USEPA Harvested Wood Products use data provided by Kenneth Skog (Forest Products Laboratory, USDA Forest Service, Madison, WI), scaled to state based on population.

[3] - ARB Model: From IPCC Mathematically Exact First-Order Decay Model, with CIWMB SWIS waste-in-place and landfill survey data.

## Diagram of the Atmospheric Flow Approach to forested lands and wood products carbon accounting for the California GHG inventory.

**1990 Net CO<sub>2</sub> Flux = Sinks + Emissions = -14.25 + 7.55 = -6.69**

*Values for 1990 in million tonnes of CO<sub>2</sub> (Biodegradable carbon only, no fossil fuel CO<sub>2</sub>)*



\* **CO<sub>2</sub> removals** from the atmosphere include vegetation biomass growth in forests and wooded range lands.

\*\* **Forested lands CO<sub>2</sub> emissions** to the atmosphere include biomass oxidation resulting from forest and range lands fires and other disturbances such as insect pest damage, forest and range land use change (development), decomposition/combustion of slash after tree harvest.

\*\*\* **Wood Products CO<sub>2</sub> emissions** to the atmosphere include: fuel wood combustion, decomposition of wood mill waste and discarded wood products in landfills and composting facilities.

### Adapted from:

- 1) Figure 12.A.2. System boundary of the Atmospheric Flow Approach. In: Chapter 12, Harvested Wood Products. Volume 4, Agriculture, Forestry, and Other Land Use (AFOLU). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. IPCC National Greenhouse Gas Inventories Programme.
- 2) Figure 1-6. Flow diagram illustrating the various destinations of pre-harvest carbon after commercial harvest. In: Baseline Greenhouse Gas Emissions for Forest, Range, and Agricultural Lands in California. (2004) California Energy Commission PIER final report 500-04-069