

# Temporal and spatial Differences in CO<sub>2</sub> Equivalent Emissions and Carbon Compensation Caused by Land Use Changes and Industrial Development in Hunan Province

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Table S1. Land use classification.

First-level land types		Second-level land categories		Description
Code	Type	Code	Type	
1	Cropland			Land planted with crops, including ripe cultivated land, newly opened land, recreational land, rotational rest land, grass field rotation crop land; land planted mainly with crops, agricultural fruit, agricultural mulberry, agricultural forestry; cultivated for more than three years of the beach and sea shoals. The arable land with guaranteed water source and irrigation facilities, which can be irrigated normally in normal years and used for growing rice, lotus root and other aquatic crops, including the arable land where rice and dryland crops are rotated.
		11	Paddy field	
		12	Dry land	The arable land without irrigation water source and facilities, growing crops by natural will water; dry crop arable land with water source and watering facilities, which can be irrigated normally in normal years; arable land mainly for growing vegetables; recreational land and rotational rest land with normal crop rotation.
2	Forest			growing trees, shrubs, bamboo, and coastal mangrove land
		21	Wooded land	Natural and planted forests with a denseness of >30%. Including timber forests, economic forests, protective forests and other mature woodlands.
		22	Shrubland	Dwarf woodland and scrubland with densities >40% and heights below 2 m.
		23	Sparse woodland	Forests with 10-30% tree densities.
		24	Other woodland	Unproductive afforestation land, traces, nurseries and various types of gardens (orchards, mulberry gardens, tea gardens, hot crop forestry gardens, etc.).
3	Grassland			All kinds of grasslands with herbaceous plants growing mainly and covering more than 5%, including scrub grasslands with mainly grazing and depression degree of less than The grasses are mainly herbaceous and cover more than 5%, including pasture-based scrub grassland and open forest grassland with less than 10% depression.
		31	High-coverage grassland	Natural grasslands, improved grasslands and mowed grasslands with >50% cover. Such grasslands generally have good moisture conditions and dense grass cover growth.
		32	Medium-coverage grassland	Natural and improved grasslands with >20-50% cover, which generally have insufficient moisture and sparse grass cover.
		33	Low-coverage grassland	Natural grasslands with a cover of 5-20%. Such grasslands lack moisture, have sparse grass cover and poor conditions for grazing use.
4	Water			Land for natural land waters and water facilities.
		41	Graff	Naturally formed or artificially excavated rivers and land below the perennial water level of the main stem. Artificial canals include embankments.
		42	Lake	Land below the perennial water level in naturally occurring waterlogged areas.
		43	Reservoir ponds	The land below the perennial water level in the artificially constructed water storage area.
		44	Permanent glacial snow	A land covered by glaciers and snow all year round.
		45	Mudflats	The tidal dip zone between the high and low tide levels of the coastal high tide.
		46	Beachland	The land between the level of the river and lake waters during the flat water period and the flood water level.
5	Built-up land			Urban and rural settlements and other industrial and mining, transportation and other land.

6	Not used	51	Urban land	Large, medium and small cities and land in built-up areas above the county town.
		52	Rural settlements	Rural settlements that are independent of towns.
		53	Other construction sites	Land for factories and mines, large industrial areas, oil fields, salt fields, quarries, etc., as well as traffic roads, airports and special land.
				Land that is currently unused, including hard-to-use land.
		61	Sandy	Land with sand cover on the surface and less than 5% vegetation cover, including desert, excluding desert in water systems.
		62	Gobi	Land where the surface is dominated by gravel and the vegetation cover is less than 5%.
		63	Saline	Land where surface salinity collects and vegetation is sparse, and where only strongly salinity-tolerant plants can grow.
		64	Marshland	Land that is flat and low-lying, poorly drained, chronically wet, seasonally waterlogged or perennially waterlogged, with wet growing plants on the surface.
		65	Bare land	Land with surface soil cover and vegetation cover of less than 5%.
		66	Bare rock texture	Land with a rocky or gravelly surface that covers >5% of its area.
		67	Other	Other unused land, including high desert, tundra, etc.

**Table S2.** Standard coal conversion coefficient and carbon emission coefficient of various energy sources.

Energy type	Standard coal conversion coefficient	Carbon emission coefficient (in C, t·t <sup>-1</sup> )	Energy type	Standard coal conversion coefficient	Carbon emission coefficient (in C, t·t <sup>-1</sup> )	Energy type	Standard coal conversion coefficient	Carbon emission coefficient (in C, t·t <sup>-1</sup> )
Raw coal (kg·kg <sup>-1</sup> )	0.7143	0.7559	Other gas (kg·m <sup>-3</sup> )	0.1786	0.3548	Fuel oil (kg·kg <sup>-1</sup> )	1.4286	0.6185
Clean coal (kg·kg <sup>-1</sup> )	0.9000	0.7559	Clean coking products (kg·kg <sup>-1</sup> )	1.1000	0.6449	Liquefied petroleum gas (kg·kg <sup>-1</sup> )	1.7143	0.5042
Other washed coal (kg·kg <sup>-1</sup> )	0.2857	0.7559	Crude (kg·kg <sup>-1</sup> )	1.4286	0.5857	Other petroleum products (kg·kg <sup>-1</sup> )	1.4286	0.586
Coke (kg·kg <sup>-1</sup> )	0.9714	0.855	Gasoline (kg·kg <sup>-1</sup> )	1.4714	0.5538	natural gas (kg·m <sup>-3</sup> )	1.2143	0.4483
Coke over gas (kg·m <sup>-3</sup> )	0.5714	0.3548	Kerosene (kg·kg <sup>-1</sup> )	1.4714	0.5714	Heat power (kg·MJ <sup>-1</sup> )	0.0341	0.26
Blast furnace gas	0.1286	0.4602	diesel oil (kg·kg <sup>-1</sup> )	1.4571	0.5921	Electricity (kg·(kW·h) <sup>-1</sup> )	0.1229	2.5255

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