EARTH POLICY INSTITUTE

Plan B Update

February 14, 2001

Tabulations for
Paving the Planet: Cars and Crops Competing for Land

FOR LAND AREA CONSUMED BY ROADS IN THE UNITED STATES—

GIVEN:

Road length. Roads were broken up into the following categories: interstates, other freeways and expressways, other principal arterials, major and minor collectors, and local roads, for both rural and urban areas in the United States. (Given in miles.)

Average number of lanes and lane width by road type. Because of varying nomenclature between the two reports for rural road systems, measurements for the United States Federal Highway Administration's "other principal arterial" designation were taken as an average of the estimates for "other highway and principal arterial." (Width given in feet.)

Shoulder and divider width. Shoulders and dividers were only assumed to take up significant land area in rural areas. (Given in feet.)

Private paved road factor. This coefficient was used to account for paved roads that were privately owned and thus not taken into consideration in federal estimates of road length.

ASSUMED:

Right-of-way width. The United States Federal Highway Administration Real Estate Office provided rough estimates of the width of tracts purchased for roads. These ranged from 50 feet wide for smaller roads in rural areas, to a minimum of 500 to 600 feet wide for many interstates. Because the right-of-way would only take up significant areas of potential farmland in rural areas, this measurement was only applied to rural road width, starting from a conservative 50 ft. width for local roads, and increasing at increments of 50 feet with each respective increase in road size.

CALCULATED (For each type of road):

Actual road width = (Average # of lanes) x (Average lane width)

Total effective road width =

(Actual road width) + (Shoulders & dividers) + (Right-of-way)

Area Consumed By Road =

(Total effective road width) x (Private road factor) x (Road length)

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FOR TOTAL LAND AREA CONSUMED BY THE CAR IN THE UNITED STATES—

GIVEN:

Size of vehicle fleet. Includes cars plus commercial vehicles.

Area of parking space. Each parking space is assumed to take up 30 square meters.

ASSUMED:

Number of parking spaces per vehicle. It was assumed that for every car in the United States, there must be at least 3 off-road parking spaces. These spaces include room to park in places of residence, workplaces, schools, shopping centers, and hospitals. This estimate does not account for spaces in multi-level or underground parking areas as it concerns the strict area of land that is lost to the car.

CALCULATED:

Area Consumed By Parking =

(Size of vehicle fleet) x (Number of parking spaces per vehicle) x (Area of parking space)

TOTAL AREA DEVOTED TO VEHICLES =

(Area Consumed by Road) + (Area Consumed by Parking)

FOR LAND AREA CONSUMED BY ROAD IN OTHER SELECTED COUNTRIES—

The relationship between the total road length and the area consumed by cars (including parking) in the United States was used to calculate a conversion factor of number of hectares of land consumed for every kilometer of road. The area consumed by road in Canada and Mexico was tabulated by multiplying the total road length in each country by the conversion factor. The same conversion factor was used for these North American countries under the assumption that they had followed a similar sort of transportation infrastructure development because of their relatively low population densities.

Because populations in the European Union and Japan are relatively more densely concentrated than in the United States, the conversion from length of road to paved area was discounted for these countries. The average road distance per vehicle for Japan, France, Germany, and the United Kingdom was calculated and then divided by the road distance needed for each vehicle in the United States (30 meters per vehicle). It was assumed that the older roads in these countries of higher population density would be about 80 percent as wide as those in the United States. Multiplying the fraction of road distance per vehicle of the EU and Japan over the United States by 80 percent, a discount rate by which to convert the land area devoted to the car in the selected countries was determined to be approximately 45 percent.

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SCENARIOS:

FOR POTENTIAL LAND AREA CONSUMED BY ROAD IN INDIA AND CHINA—

Vehicle ownership level is defined as the number of vehicles per thousand people in a given country. The vehicle ownership level of industrialized countries is at least 500, or one car for every 2 people. This industrial vehicle ownership level was used along with the current vehicle fleet size in India and China to calculate the necessary fleet size increase if India and China were to reach industrialized automobile ownership levels.

Because the populations of India and China are relatively concentrated, it was assumed that each automobile would consume an area of land similar to that of France, Germany, and the United Kingdom, which is 0.02 hectares of land for each automobile. This factor was used along with the road length of the 2 countries to calculate the total "paved" area needed to accommodate the potential automobile fleet size increase.

GIVEN:

Current vehicle fleet size. Includes cars plus commercial vehicles.

Total road length. Note that the portion of unpaved roads in India and China is higher than in the previously analyzed industrialized countries, but the effective "paved" area is calculated in the same manner. This is because the effective land area lost for a road is roughly the same, regardless of the manner of construction.

ASSUMED:

Industrialized vehicle ownership level (IVOH). This is assumed to be at least 500 vehicles for every 1,000 people.

CALCULATED:

Vehicle fleet size at industrialized vehicle ownership level (IVOH)=

(Current fleet size) x (IVOH)/(current vehicle ownership level)

Total potential "paved" area with fleet increase =

(Vehicle fleet size at IVOH) x (0.02 hectares/vehicle)

See all data at www.earthpolicy.org/datacenter/xls/alert12_all.xls.

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