ORNL/CDIAC-119
NDP-068

Geographical Distribution of Biomass Carbon in Tropical Southeast Asian Forests: A Database

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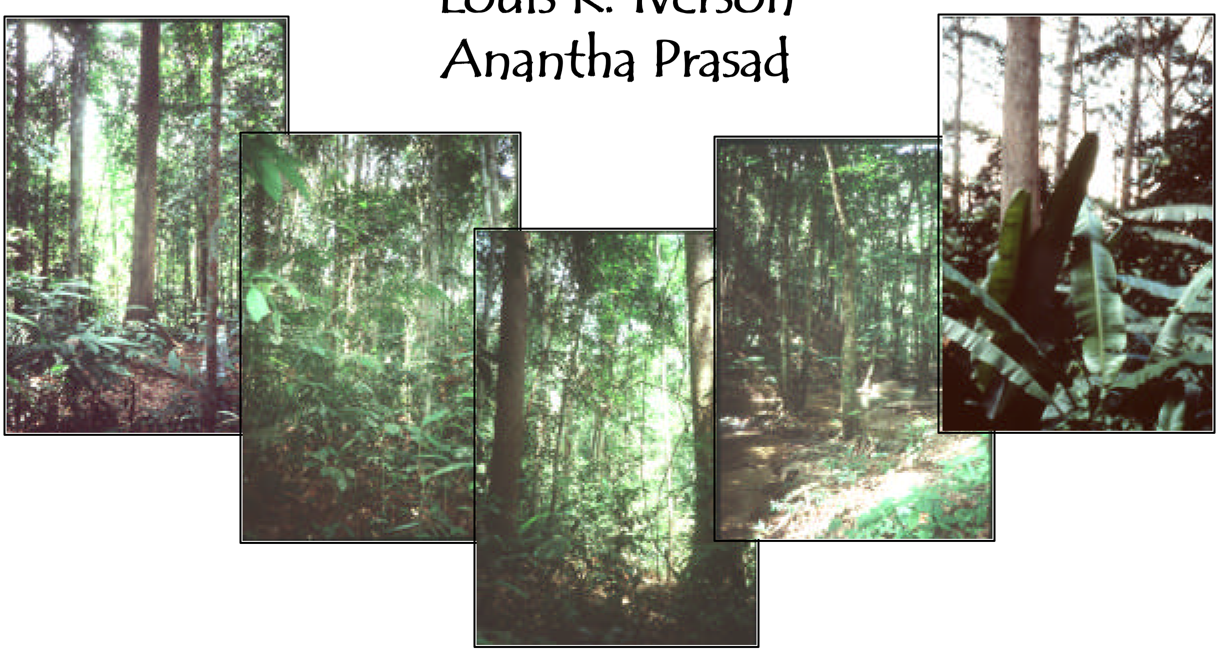

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Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory

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Geographical Distribution of Biomass Carbon in Tropical Southeast Asian Forests: A Database

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ABSTRACT

BROWN, S., L. R. IVERSON, AND A. PRASAD. 2001. *Geographical Distribution of Biomass Carbon in Tropical Southeast Asian Forests: A Database*. ORNL/CDIAC-119, NDP-068. Carbon Dioxide Information Analysis Center, U.S. Department of Energy, Oak Ridge National Laboratory, Oak Ridge, Tennessee, U.S.A. 75 pp.

A database was generated of estimates of geographically referenced carbon densities of forest vegetation in tropical Southeast Asia for 1980. A geographic information system (GIS) was used to incorporate spatial databases of climatic, edaphic, and geomorphological indices and vegetation to estimate potential (i.e., in the absence of human intervention and natural disturbance) carbon densities of forests. The resulting map was then modified to estimate actual 1980 carbon density as a function of population density and climatic zone. The database covers the following 13 countries: Bangladesh, Brunei, Cambodia (Campuchea), India, Indonesia, Laos, Malaysia, Myanmar (Burma), Nepal, the Philippines, Sri Lanka, Thailand, and Vietnam.

The data sets within this database are provided in three file formats: ARC/INFO™ exported integer grids, ASCII (American Standard Code for Information Interchange) files formatted for raster-based GIS software packages, and generic ASCII files with *x, y* coordinates for use with non-GIS software packages.

This database includes ten ARC/INFO exported integer grid files (five with the pixel size 3.75 km x 3.75 km and five with the pixel size 0.25 degree longitude x 0.25 degree latitude) and 27 ASCII files. The first ASCII file contains the documentation associated with this database. Twenty-four of the ASCII files were generated by means of the ARC/INFO GRIDASCII command and can be used by most raster-based GIS software packages. The 24 files can be subdivided into two groups of 12 files each. These files contain real data values representing actual carbon and potential carbon density in Mg C/ha (1 megagram = 10^6 grams) and integer- coded values for country name, Weck's Climatic Index, ecofloristic zone, elevation, forest or non-forest designation, population density, mean annual precipitation, slope, soil texture, and vegetation classification. One set of 12 files contains these data at a spatial resolution of 3.75 km, whereas the other set of 12 files has a spatial resolution of 0.25 degree. The remaining two ASCII data files combine all of the data from the 24 ASCII data files into 2 single generic data files. The first file has a spatial resolution of 3.75 km, and the second has a resolution of 0.25 degree. Both files also provide a grid-cell identification number and the longitude and latitude of the centerpoint of each grid cell.

The 3.75-km data in this numeric data package yield an actual total carbon estimate of 42.1 Pg (1 petagram = 10^{15} grams) and a potential carbon estimate of 73.6 Pg; whereas the 0.25-degree data produced an actual total carbon estimate of 41.8 Pg and a total potential carbon estimate of 73.9 Pg.

Fortran and SAS™ access codes are provided to read the ASCII data files, and ARC/INFO and

ARCVIEW command syntax are provided to import the ARC/INFO exported integer grid files. The data files and this documentation are available without charge on a variety of media and via the Internet from the Carbon Dioxide Information Analysis Center (CDIAC).

Keywords: biomass, carbon, carbon cycle, climate, elevation, forest, land use, organic matter, population, slope, soil, Southeast Asia, tropics, vegetation

1. BACKGROUND INFORMATION

Quantification of the role of changing land use in the global cycling of carbon (and, consequently, in controlling atmospheric concentrations of carbon dioxide, the single most important anthropogenic greenhouse gas) requires complete, consistent, and accurate databases of vegetation, land use, and biospheric carbon content. The Carbon Dioxide Information Analysis Center (CDIAC) has previously made available several important quality-assured and documented databases on this topic (Olson et al. 1985, Richards and Flint 1994, Houghton and Hackler 1995, and Brown et al. 1996).

This database (NDP-068) expands the series by providing detailed geographically referenced information on actual and potential biomass carbon (1 g biomass = 0.5 g C) in tropical Southeast Asia and all the background information used to generate those files. A geographic information system (GIS) was used to incorporate spatial databases of climatic, edaphic, and geomorphological indices and vegetation to estimate potential (without human influence) carbon densities of forests in 1980. The resulting estimates were then modified to produce estimates of actual carbon density as a function of population density and climatic zone.

Estimates of carbon in the biomass (aboveground and belowground) of tropical Southeast Asian forests for the year 1980 were generated by means of a GIS modeling approach, on the basis of the assumption that "the present distribution of forest biomass density is a function of the potential biomass the landscape can support under the prevailing climatic, edaphic and geomorphological conditions and the cumulative impact of human activities such as logging, fuel-wood collection, shifting cultivation, and other activities that reduce the biomass" (Brown et al. 1993). The database covers the following 13 countries: Bangladesh, Brunei, Cambodia (Campuchea), India, Indonesia, Laos, Malaysia [Peninsular (Malaya) and Insular (Sabah, also known as North Borneo, and Sarawak)], Myanmar (Burma), Nepal, the Philippines, Sri Lanka, Thailand, and Vietnam (Fig. 1).

A thorough description of the methods and data sources can be found in Brown et al. (1993). To calculate potential and actual aboveground biomass carbon densities, the general methodology of Risser and Iverson (1988) and Iverson et al. (1994) was followed. This consisted of a simple weighted additive model of data layers of elevation and slope, precipitation, Weck's Climatic Index, and soil texture to arrive at a score for potential biomass density for each pixel. Elevation data (Fig. 2) were derived from a U.S. National Geophysical Data Center elevation map; soil texture data (Fig. 3) and slope data (Fig. 4) were derived from the Soil Map of the World produced by the Food and Agriculture Organization (FAO)—United Nations Educational, Scientific, and Cultural Organization; and annual precipitation (Fig. 5) and a modified Weck's Climatic Index (Weck 1970) (Fig. 6) were interpolated from about 600 stations in the FAO agro-meteorological database. Results were compared with independent ground-truth information and iteratively reprocessed to within certain bounds to obtain a satisfactory result. The map results were overlaid with forest/non-forest data (Fig. 7) from circa 1980, resulting in a map of potential carbon densities (Fig. 8). The forest/non-forest data were derived from a FAO vegetation map (Fig. 9) of continental tropical Southeast Asia and a World

Conservation Monitoring Center map of forested areas of insular Asia. The resulting potential biomass was compared with ecofloristic zones (Fig. 10) derived from an FAO map, confirming the reasonableness of the model-derived estimates.

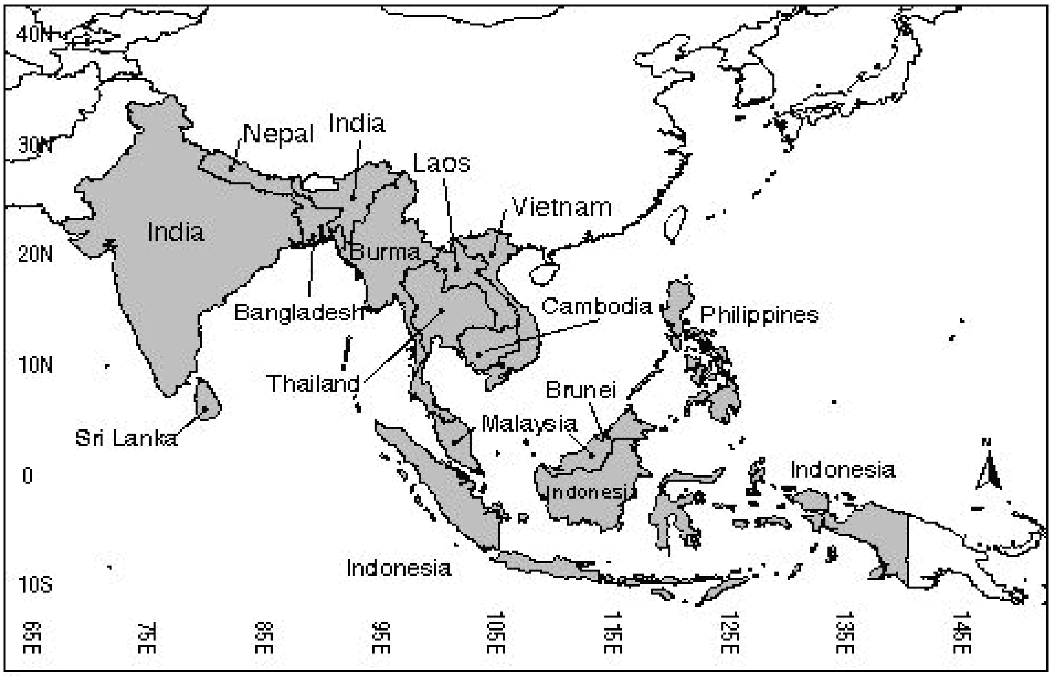


Fig. 1. Countries of the study area.

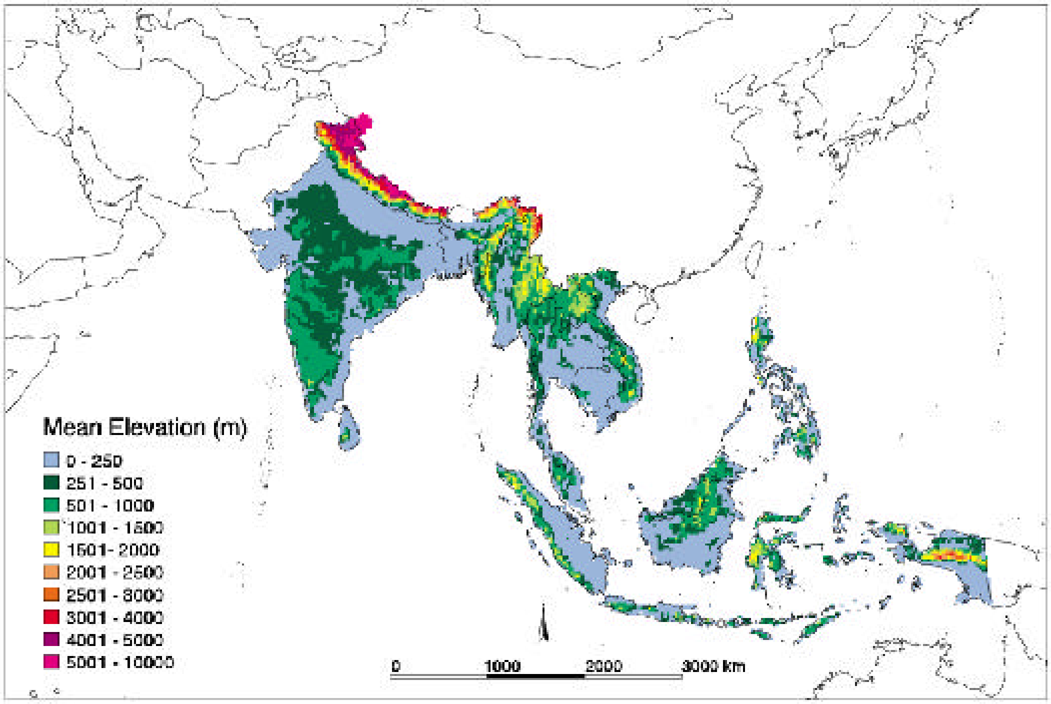


Fig. 2. Mean elevation for the study area, displayed with 0.25-degree resolution.

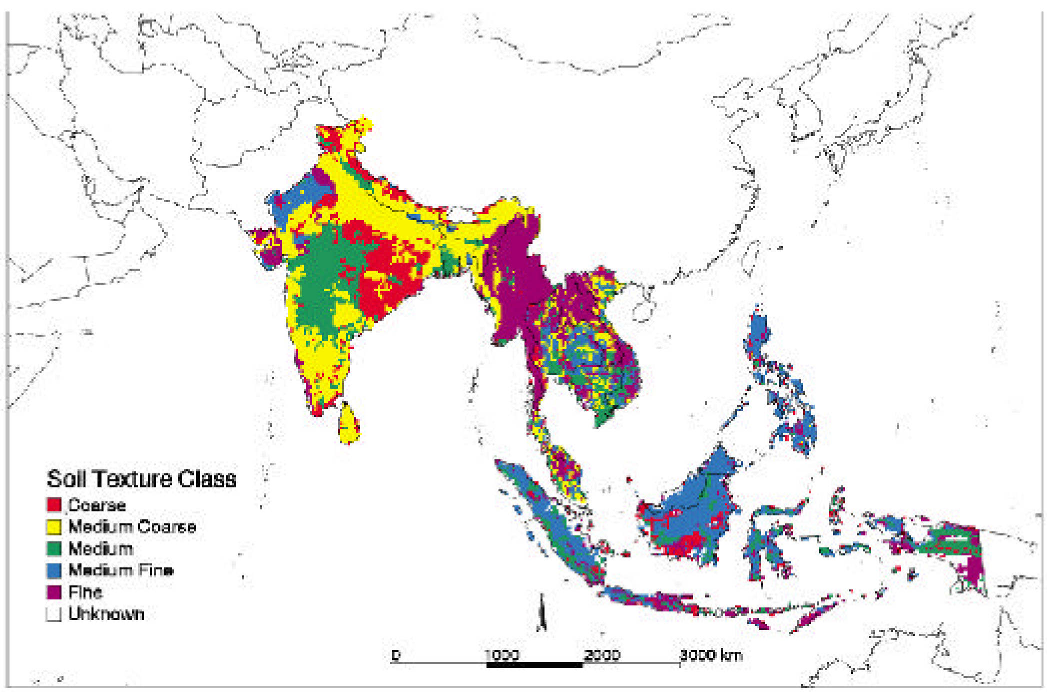


Fig. 3. Soil texture class for the study area, displayed with 0.25-degree resolution.

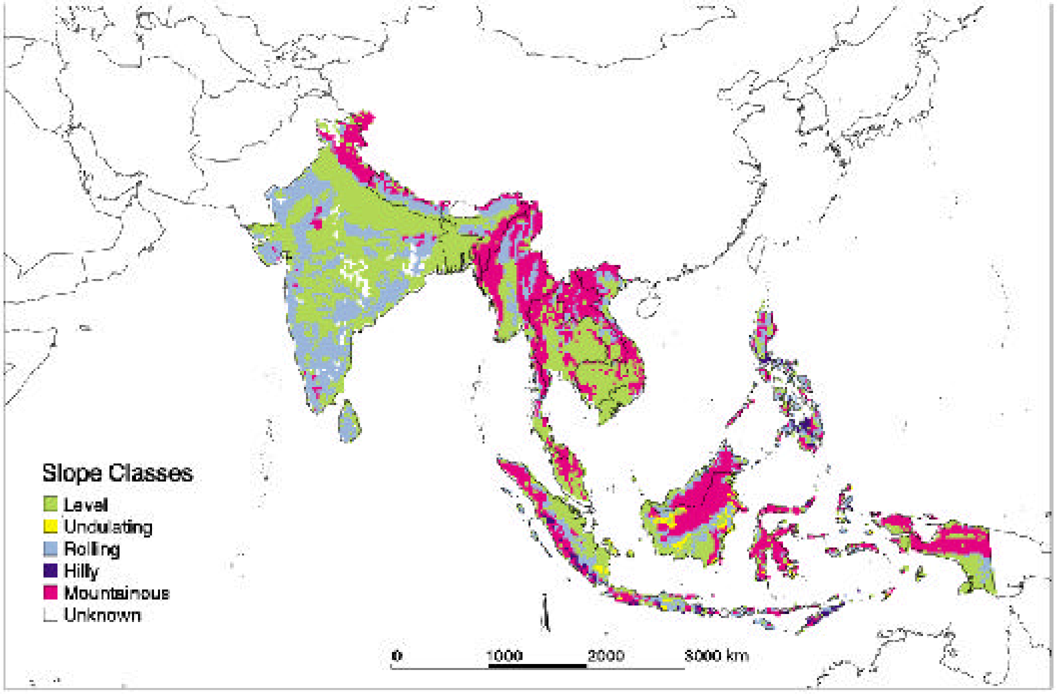


Fig. 4. **Mean slope class for the study area, displayed with 0.25-degree resolution.**

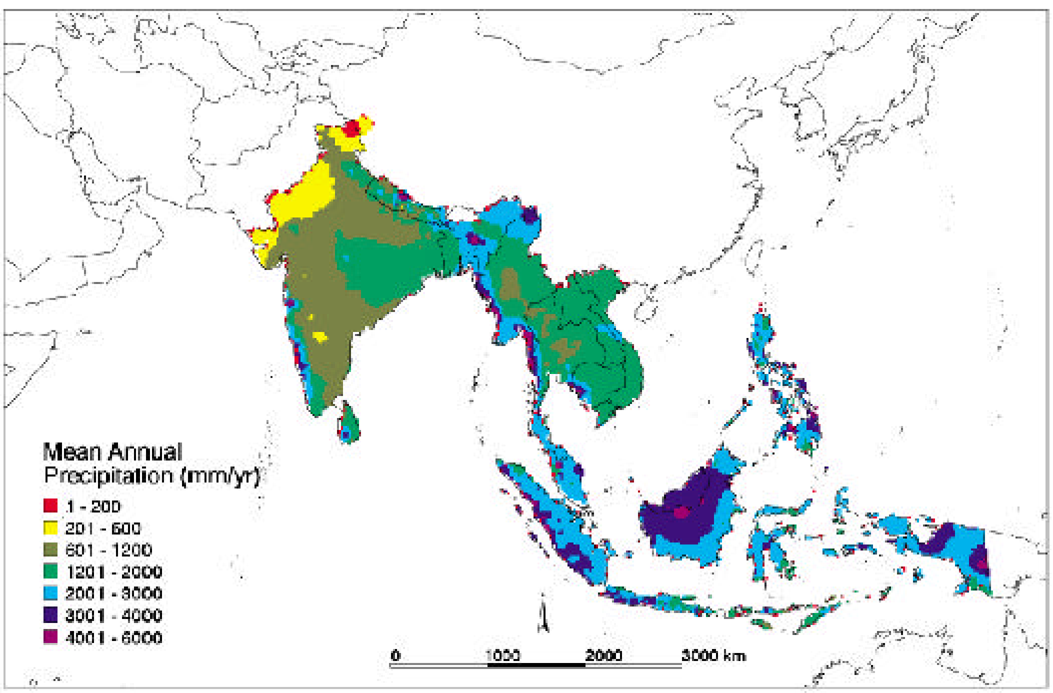


Fig. 5. Mean annual precipitation for the study area, displayed with 0.25-degree resolution.

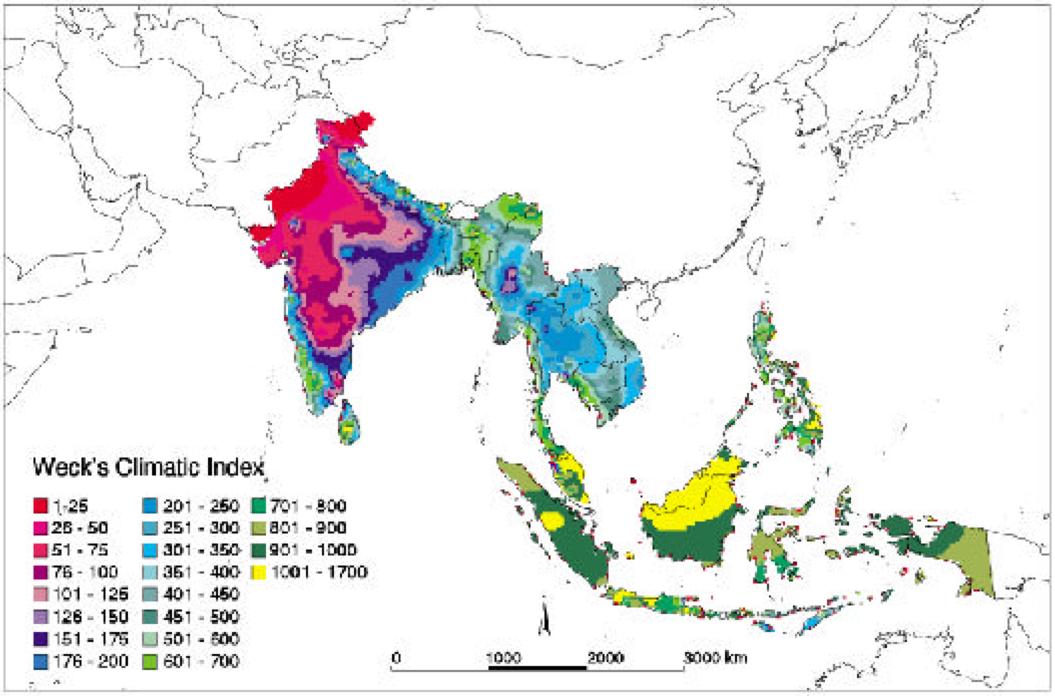
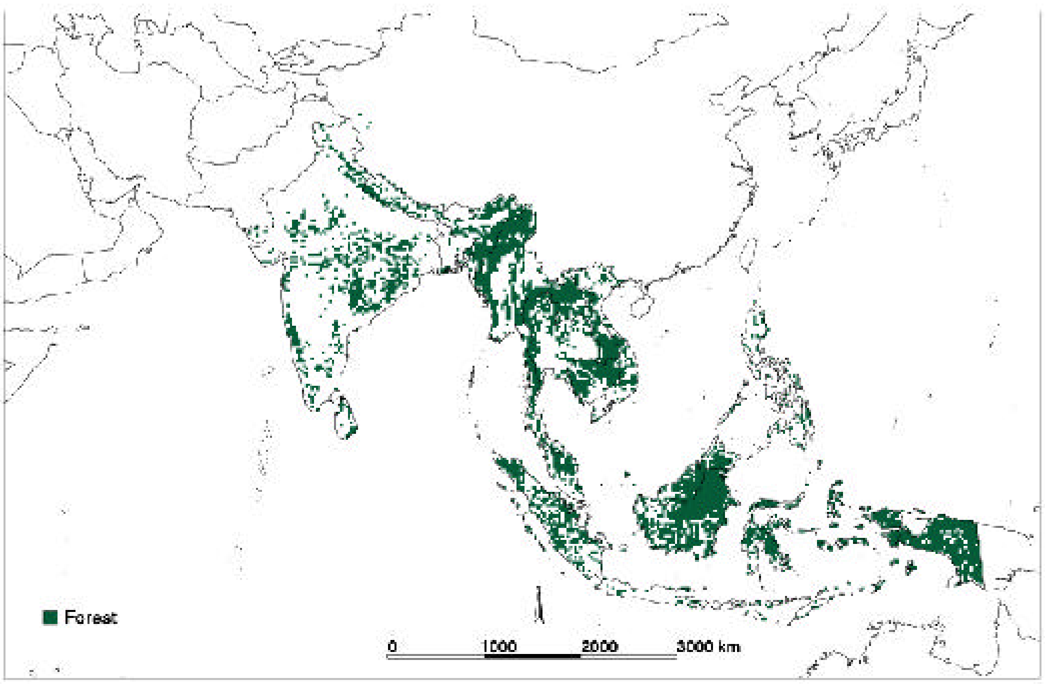


Fig. 6. Weck's Climatic Index for the study area, displayed



with 0.25-degree resolution.

Fig. 7. Forest/non-forest classification of the study area, displayed with 0.25-degree resolution.

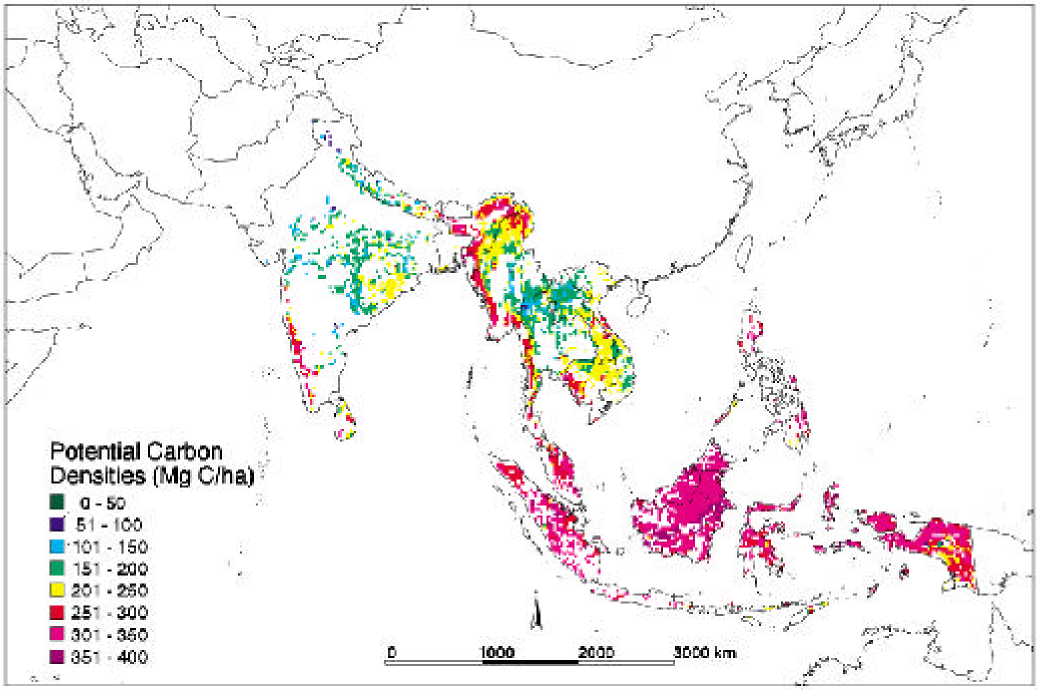
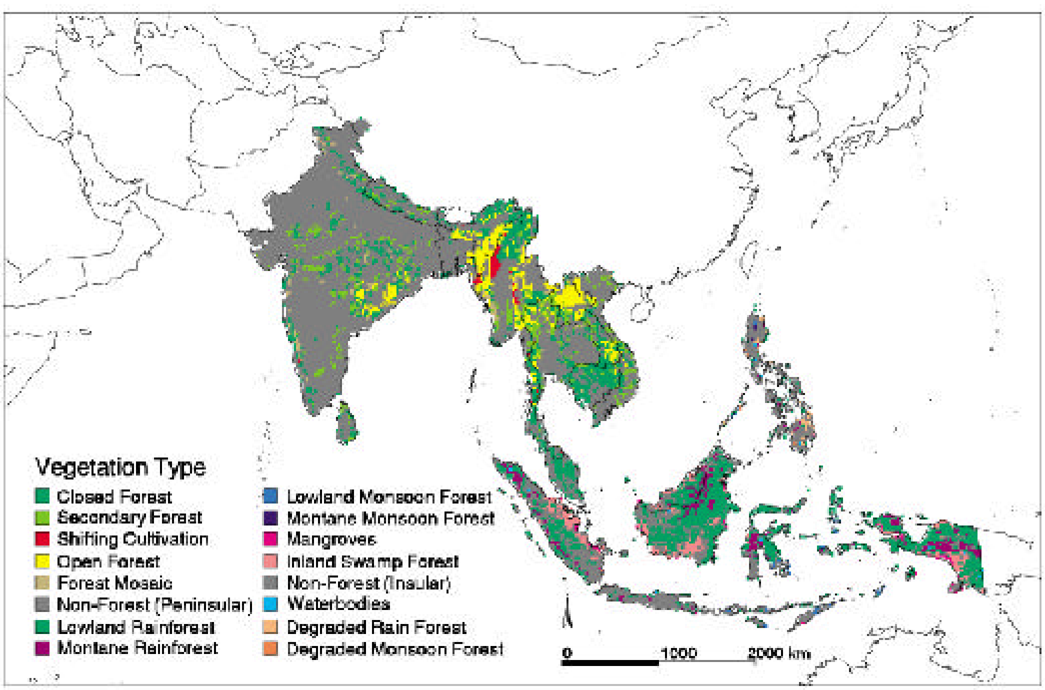


Fig. 8. Potential carbon densities in forests of the study area, displayed with 0.25-degree resolution.

Fig. 9. Vegetation type in the study area, displayed with 0.25-degree resolution.



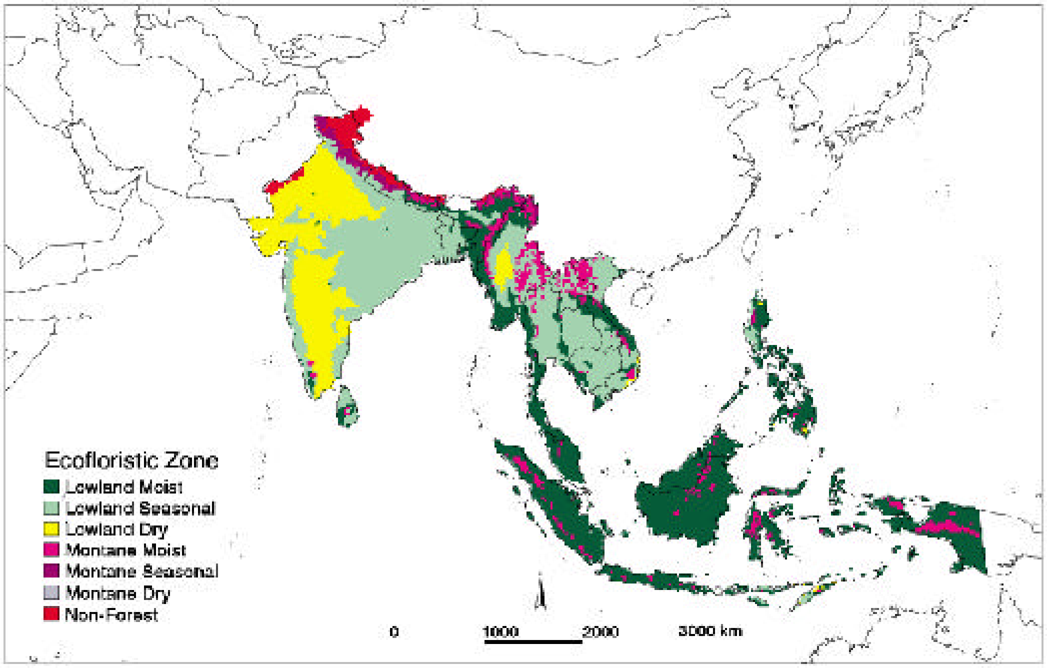
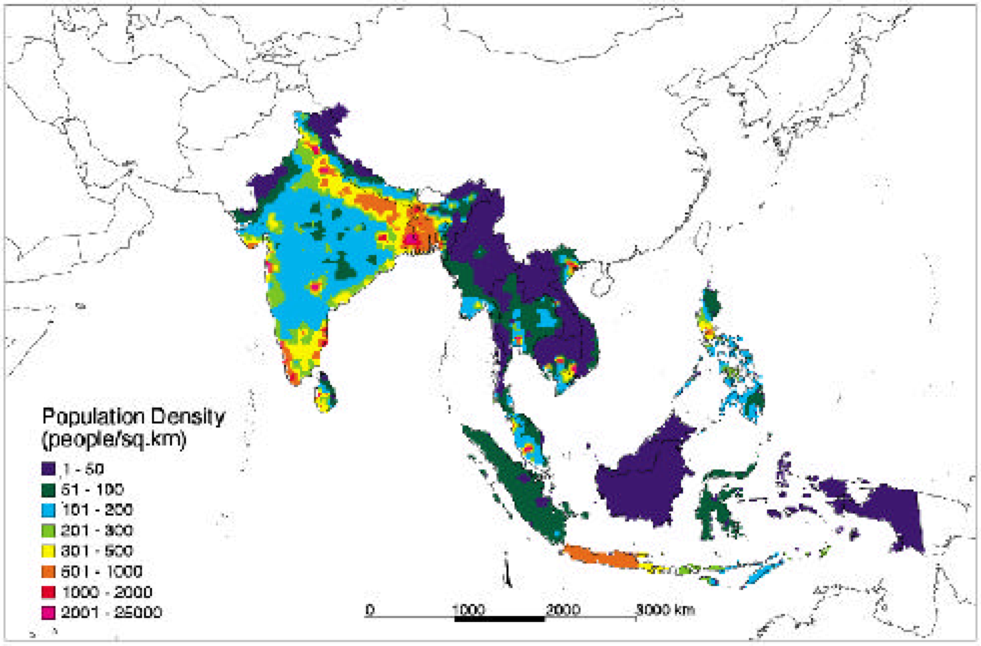


Fig. 10. Ecofloristic zone classification for the study area, displayed with 0.25-degree resolution.

Ratios of forest degradation (from increasing population) were calculated from forest inventory data and the calculated potential biomass densities for 47 subnational units in Bangladesh, India, Malaysia (Peninsular and Insular), the Philippines, Sri Lanka, Thailand, and Vietnam. Linear regression of the forest degradation ratio versus population density (natural-log transformed) showed the effect of population density on the forest degradation ratio to be greatest in dry, followed by seasonal, then moist, forests. The regression equations were then used in conjunction with the potential biomass carbon density, population (Fig. 11), and precipitation maps [used to delineate climatic zones: aseasonal moist (>2000 mm/year), seasonally moist (1500 to 2000 mm/year), and dry (<1500 mm/year)] to estimate the actual biomass carbon densities of the forests. At very high and very low population densities, default degradation ratios of 0.06 and 1.0, respectively, were used. Population density was based on data from the FAO Demographic and Statistics Department.

Root:shoot ratios were calculated from previously published data of belowground biomass and stratified according to climate zones based on precipitation and elevation. Three climate zones were recognized: dry (<1200 mm/year for lowland), seasonal (1200 to 2000 mm/year for lowland and 500 to 1200 mm/year for montane), and moist (>2000 mm/year for lowland and >1200 mm/year for montane), where lowland is defined as elevation #1000 m and montane as elevation >1000 m. Moist forests were assigned a root:shoot ratio of 0.18; seasonal forests, 0.10; and dry forests, 0.5. These ratios were used to calculate belowground biomass from the aboveground biomass estimate for each pixel. Total biomass (Fig. 12) was calculated as the sum of the below-ground and above-ground estimates.



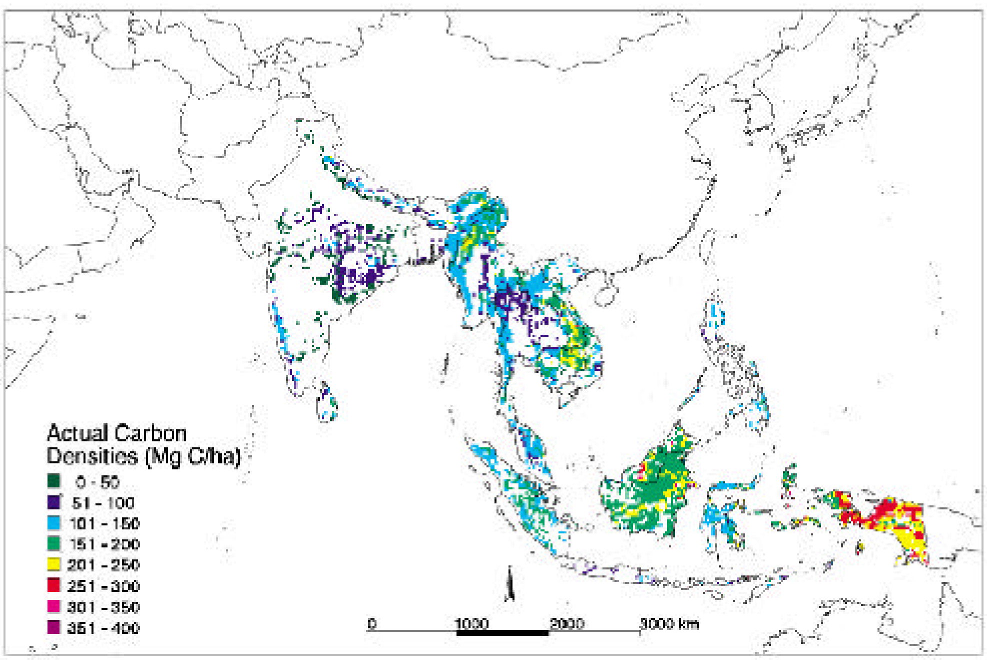


Fig. 11. Population density in the study area, displayed with 0.25-degree resolution.

Fig. 12. Actual carbon densities in forests of the study area, displayed with 0.25-degree resolution.

Brown et al. (1993) compared their estimates of biomass carbon density with those of other recent assessments for the same 13-country study area. They found that estimates of biomass carbon densities derived from the FAO Tropical Forest Resource Assessment 1990 Project were about 75% of their own, and that estimates of 1980 biomass carbon density of Flint and Richards (1994) for forests and woodlands were about 65% of their own. Although differences exist between the estimates of Brown et al. and the other two studies, the three sets of values are similar in order of magnitude despite differences in methodology, input data, and time of assessment. The general similarity of the estimates provides compelling evidence that forests of tropical Asian countries have generally low biomass carbon densities; these low densities are most likely due to the long history of human use in the region.

2. APPLICATIONS OF THE DATA

The maps generated from the these data lend themselves to comparisons with, for example, spatial representations of land-use changes determined from satellite imagery. Consequently, uncertainties associated with carbon fluxes from tropical Southeast Asia can be reduced, and processes in the global carbon cycle (e.g., forest clearing, degradation, and regrowth) can be better quantified.

3. DATA LIMITATIONS AND RESTRICTIONS

The biomass estimates are limited to trees with a diameter of at least 10 cm (5 cm in more open forests); this would result in a slight underestimate (less than 5%) of aboveground biomass in closed forests and an unknown amount of underestimate in open forests; the estimates also exclude litter (Brown et al. 1993). Brown et al. (1993) compared their model-derived biomass carbon density estimates with values from forest inventories. They report that their model tended to produce slight overestimates: <5% for carbon densities of <250 Mg/ha and #8% for carbon densities of 250-400 Mg/ha.

The estimates provided in this numeric data package also exclude soil carbon, although Brown et al. (1993) describe the estimation of soil carbon for tropical Southeast Asia.

Brown et al. (1993) evaluated the errors in estimates of carbon densities from both methodology and data limitations. In general, they caution that, while general patterns would be reliable, carbon densities cannot be precisely located to the level of an individual pixel. The original vegetation and soil maps showed insufficient detail and might not always have been fully accurate. The precipitation, Weck's Climatic Index, and population maps were generated from point data, although interpolation error from these types of data was minimized by using a two-dimensional interpolation method and by comparing results with other maps. Potential error in weighting schemes was minimized by developing varying-width classes for each of the input variables. Omitting the effects of roads, shifting cultivation, and the differentiation between broadleaf and conifer species was considered acceptable, given the scale of the final maps. Correlation between population density and the calculated forest degradation index was low for some regions. New information on forest inventories can alleviate these uncertainties. It must also be noted that understory and fine and coarse litter were not included in the total carbon estimates; correction for this omission could add another 20 to 30% to the estimates of total biomass carbon density. Explicit accounting of large-scale disturbances was also not included. As new data become available, the same basic methodology for calculating carbon densities in biomass and soils can be readily applied, differences analyzed, and uncertainties further reduced (Brown et al. 1993, Iverson et al.1994).

The gridded database described in this numeric data package defines tropical Southeast Asia as originating at !5879340.56205 m longitude (44.25875 degrees), !1221655.95152 m latitude (!16.52954 degrees) and extending to 3863159.43795 m longitude (149.50875 degrees), 4808344.04848 m latitude (42.97046 degrees). Data are provided for the following 13 countries: Bangladesh, Brunei, Cambodia (Campuchea), India, Indonesia, Laos, Malaysia [Peninsular (Malaya) and Insular (Sabah, also known as North Borneo, and Sarawak)], Myanmar (Burma), Nepal, the Philippines, Sri Lanka, Thailand, and Vietnam. The country boundary information was originally received from the contributors in vector format as continental and insular polygon coverages. The source polygons contained boundaries for fifteen countries in Asia, including the 13 aforementioned countries, as well as Pakistan and Papua New Guinea. For distribution purposes, the polygon data were joined together into single polygon coverage and then converted to a grid. As a result of this rasterization process, a few grid cells are defined as Pakistan or Papua New Guinea although they contain no real data. Furthermore, the gridded country boundaries within this database should not be used to define countries for other datasets, because the rasterization process produces generalized boundary lines.

4. QUALITY-ASSURANCE CHECKS AND DATA-PROCESSING ACTIVITIES PERFORMED BY CDIAC

An important part of the data packaging process at CDIAC involves the quality assurance (QA) of data before distribution. To guarantee data of the highest possible quality, CDIAC performs extensive QA checks, examining the data for completeness, reasonableness, and accuracy.

The data as obtained from the contributors consisted of 17 ARC/INFO-exported integer grids with a pixel size of approximately 3.75 km x 3.75 km. Actual and potential carbon densities (Mg C/ha), as well as ecofloristic zone and vegetation classification, were provided individually for continental and insular Southeast Asia. Separate country boundaries were provided for insular and continental Southeast Asia. These ten grids were transformed into an Albers Projection, but with a unique set of projection parameters for continental and insular Southeast Asia. Population density, mean annual precipitation, elevation, slope, soil texture, forest/non-forest designation, and Weck’s Climatic

Index data were assembled collectively for all of Southeast Asia. These seven grids were not projected (i.e., they can be referred to as being in a "geographic projection").

For distribution purposes the continental and insular data were combined into common grids. The following methodology was used:

1. Each of the 17 grids originally received from the contributors was re-projected into an Albers Projection with a cell size of 3750 m by using the following parameters:

```
1st standard parallel:              30 08 24.000
2nd standard parallel:              -4 17 24.000
central meridian:                  107 28 12.000
latitude of projection's origin:       0 0 0.000
false easting (meters):                  0.00000
false northing (meters):                 0.00000
```

2. Each of the 17 newly projected grids was assigned a missing-value indicator of !9999.

3. The value attribute tables for the continental and insular grids were reviewed for consistency and redundancy. Numeric data values were re-assigned as necessary.

4. The population grid was designated as a base grid because it included the combined spatial extent of real data contained in each of the 17 grids.

5. The continental grids for actual carbon density, potential carbon density, ecofloristic zone, vegetation code, and country name were combined with their corresponding insular grids and the base grid by using the ARC/INFO GRID command COMBINE.

6. The seven remaining grids were reformatted to match the extent of the base grid. This was accomplished by using the ARC/INFO GRID command COMBINE with the base grid.

Performing these six steps resulted in 12 grids with identical parameters. The 12 grids became the core data layers used to prepare the 37 data files included in this numeric data package.

The first file is merely a flat ASCII text file containing a copy of this documentation. Ten of the 37 files are exported ARC/INFO integer grids, five with 3.75-km pixel size and five with 0.25-degree pixel size.

The 3.75-km exported ARC/INFO grids included within this numeric data package were generated by using the ARC/INFO GRID command COMBINE and were grouped as follows:

1. Actual and potential carbon were combined into a common grid called BIOMASS.

2. Mean annual precipitation and Weck's Climatic Index were combined into a common grid called CLIMATE.

3. Population and country were combined into a common demographic grid called DEMOG.

4. Slope, soil texture, and elevation were grouped into a common landform grid called LAND.

5. Forest designation, ecofloristic zone, and vegetation index were grouped into a common vegetation grid called VEGT.

Resampling is the process of determining values for grid cells that are geometrically transformed from a source grid into a grid of a different spatial resolution. ARC/INFO GRID offers three resampling techniques: nearest neighbor assignment, bilinear interpolation, and cubic convolution.The nearest neighbor assignment process identifies the input grid cell closest to the output grid-cell center and assigns this value to the entire output grid cell. The bilinear interpolation method of resampling identifies the four nearest input cell centers surrounding the output grid-cell center, then calculates a weighted mean of those values, and assigns the mean to the output grid-cell center. Cubic convolution is a computationally intensive interpolation method that fits a cubic polynomial surface to a 4 x 4 (16-pixel) neighborhood of cells to produce a smooth resultant from a distance-weighted mean. The mean and variance of the output distribution match the input distribution; however, the range of data values may be altered as a result of this process of smoothing the data.

The online documentation for ARC/INFO Version 7.2.1 offers the following guidance on resampling methods. Nearest neighbor is the preferred resampling method for categorical data because it does not alter the value of the input cells. It should be used for nominal or ordinal data where each value represents a class of data values rather than discrete data values. Bilinear interpolation is recommended for continuous surfaces because a known point or phenomenon determines the assigned value (e.g., elevation, and slope). Cubic convolution tends to smooth the data more than bilinear interpolation because of the smooth curves used as well as the larger number of points evaluated. Cubic convolution is the best method when total yields need to be determined (e.g., total CO_2 emissions per country). All three techniques can be applied to continuous data, with nearest neighbor producing the most blocky output, and cubic convolution, the smoothest. However, neither bilinear interpolation nor cubic convolution should be used to resample categorical data.

The 0.25-degree ARC/INFO exported integer grids were generated as follows:

1. Each of the five 3.75-km grids was unprojected (i.e., re-projected from an Albers into a geographic projection).

2. Missing data values were changed from –9999 to "NO DATA" by using the ARC/INFO GRID SELECT command for resampling purposes.

3. Nearest neighbor, bilinear interpolation, and cubic convolution algorithms were each used to resample actual and potential carbon biomass estimates in the BIOMASS grid to a 0.25-degree resolution.

4. The products of the resampled data were then projected back to Albers and summed. Based on a comparison of the following actual and potential biomass carbon estimates with values published by Brown et al. (1993), the cubic convolution method of resampling was used to produce the 0.25-degree biomass grid in this numeric data package.

Resampling method	Actual carbon (Pg)	Potential carbon (Pg)
Nearest neighbor	41.7256	73.8159
Bilinear interpolation	41.7286	73.8847
Cubic convolution	41.7583	73.9194

5. The remaining four grids were resampled by using the nearest neighbor assignment method because each grid contained only categorical data.

6. The resulting five 0.25-degree grids (i.e., BIOMASSX, CLIMATEX, DEMOGX, LANDX, and VEGTX) have attributes comparable, but not identical, to those found in the 3.75-km grids in this numeric data package.

Table 1 displays the data ranges for the variables in each of the ten ARC/INFO GRIDS to illustrate the redistribution of the data after the resampling process.

Table 1. Redistribution of the data as a result of the resampling process

Variable name	Number of unique values	Minimum	Maximum	Cell size	Grid name
AC	281	7	383	3.75 km	BIOMASS
AC	279	7	336	0.25 degree	BIOMASSX
PC	30	14	393	3.75 km	BIOMASS
PC	288	43	402	0.25 degree	BIOMASSX
CLIMI	20	1	20	3.75 km	CLIMATE
CLIMI	20	1	20	0.25 degree	CLIMATEX
PRECIP	13	1	13	3.75 km	CLIMATE
PRECIP	13	1	13	0.25 degree	CLIMATEX
POP	14	1	14	3.75 km	DEMOG
POP	14	1	14	0.25 degree	DEMOGX
CNTRY	16	1	16	3.75 km	DEMOG
CNTRY	16	1	16	0.25 degree	DEMOGX
SLOPE	6	1	6	3.75 km	LAND
SLOPE	6	1	6	0.25 degree	LANDX
ELEV	10	1	10	3.75 km	LAND
ELEV	10	1	10	0.25 degree	LANDX
SOILT	6	1	6	3.75 km	LAND
SOILT	6	1	6	0.25 degree	LANDX
FOREST	2	1	2	3.75 km	VEGT
FOREST	2	1	2	0.25 degree	VEGTX
EFZ	6	2	9	3.75 km	VEGT
EFZ	6	2	9	0.25 degree	VEGTX
VEG	16	1	20	3.75 km	VEGT

Variable name	Number of unique values	Minimum	Maximum	Cell size	Grid name
VEG	16	1	20	0.25 degree	VEGTX

The cubic convolution method of resampling was used to transfer the data values of AC and PC in the BIOMASS (3.75-km) grid to the BIOMASSX (0.25-degree) grid. The data for AC in the 3.75-km grid range from 7 to 383, with 281 unique data values. After the resampling, the data for AC in the BIOMASSX (0.25-degree) grid ranged from 7 to 336, with 279 unique data values. The data for PC in the BIOMASS (3.75-km) grid ranged from 14 to 393, with 30 unique data values. After the resampling, they ranged from 43 to 402, with 288 unique data values in the BIOMASSX (0.25-degree) grid.

The nearest neighbor method of resampling was used to transfer the data values of CLIMI, PRECIP, POP, CNTRY, SLOPE, ELEV, SOILT, FOREST, EFZ, and VEG in the remaining 3.75-km grids (CLIMATE, DEMOG, LAND, and VEGT) to the 0.25-degree grids (CLIMATEX, DEMOGX, LANDX, and VEGTX). Note that the data range and number of unique data values did not change for these variables.

Twenty-four of the 26 remaining ASCII files were generated directly from the 10 ARC/INFO GRIDS (five 3.75-km grids and five 0.25-degree grids) by using the GRIDASCII command. The GRIDASCII command produces raster-based data files that can be used by most GIS software packages (and read by non-GIS software packages, as well). Each file contains *R* lines (where *R* = the number of rows in the grid + six header lines). Lines 1 through 6 contain the following values: the number of columns in the grid (line 1), the number of rows in the grid (line 2), the lower left-hand *x* (longitude) coordinate (line 3), the lower left-hand *y* (latitude) coordinate (line 4), the grid-cell size (line 5), and a definition of the grid's no-data value (line 6). The remaining lines in the file represent individual columns of data in the grid. For example, if there are 3066 columns and 1736 rows of data, there would be 1743 lines in the file. Lines 1 through 6 would contain the aforementioned header information, while lines 7 to 1743 would contain 3066 data values, each separated by a single space. Table 2 shows the arguments used with the GRIDASCII syntax to produce the 12 ASCII data files from the 3.75-km data and the 12 ASCII data files from the 0.25-degree data.

Table 2. GRIDASCII syntax used to produce the ASCII data files

Grid name	Output file name	Variable name	Variable description
BIOMASS	ac.dat	AC	Actual biomass carbon in Mg C/ha
BIOMASS	pc.dat	PC	Potential biomass carbon in Mg C/ha
CLIMATE	climi.dat	CLIMI	Weck's Climatic Index code
CLIMATE	precip.dat	PRECIP	Mean annual precipitation code
DEMOG	pop.dat	POP	Population density code
DEMOG	cntry.dat	CNTRY	Country code
LAND	slope.dat	SLOPE	Slope code
LAND	elev.dat	ELEV	Mean elevation code
LAND	soilt.dat	SOILT	Soil texture code
VEGT	forest.dat	FOREST	Forest or non-forest code
VEGT	efz.dat	EFZ	Ecofloristic zone code
VEGT	veg.dat	VEG	Vegetation code
BIOMASSX	acx.dat	AC	Actual biomass carbon in Mg C/ha
BIOMASSX	pcx.dat	PC	Potential biomass carbon in Mg C/ha
CLIMATEX	climix.dat	CLIMI	Weck's Climatic Index code
CLIMATEX	precipx.dat	PRECIP	Mean annual precipitation code
DEMOGX	popx.dat	POP	Population density code
DEMOGX	cntryx.dat	CNTRY	Country code
LANDX	slopex.dat	SLOPE	Slope code
LANDX	elevx.dat	ELEV	Mean elevation code
LANDX	soiltx.dat	SOILT	Soil texture code
VEGTX	forestx.dat	FOREST	Forest or non-forest code
VEGTX	efzx.dat	EFZ	Ecofloristic zone code

Grid name	Output file name	Variable name	Variable description
VEGTX	vegx.dat	VEG	Vegetation code

The remaining two generic ASCII files with longitude and latitude (*x*, *y*) coordinates were produced as follows:

1. A point coverage was generated from the BIOMASS grid by using the ARC/INFO GRIDPOINT command.

2. The ARC/INFO PROJECT command was used to project the meter coordinates into decimal degrees.

3. The output coverage from step 2 was ungenerated to produce an ASCII file containing a grid-cell id number, longitude, and latitude for each of the 4,177,584 grid-cell centers.

4. The 12 ASCII files produced by the GRIDASCII command for the 3.75-km data were then merged, one file at a time, with the file produced in step 3.

5. The result of steps 1 through 4 is a file called se_asia.dat with 4,177,584 records containing the following variables: grid-cell identification number, longitude in decimal degrees of the centerpoint of each grid cell, latitude in decimal degrees of the centerpoint of each grid cell, actual biomass carbon, potential biomass carbon, precipitation, population, country, slope, soil texture, forest designation, ecofloristic zone, and vegetation index.

6. A point coverage was generated from the BIOMASSX grid by using the ARC/INFO GRIDPOINT command.

7. The 12 ASCII files produced by the GRIDASCII command for the 0.25-degree data were then merged, one file at a time, with the files produced in step 6. Note that, because these data are provided in an unprojected format, there was no need to use a projection step to assemble these data for distribution.

8. Steps 6 and 7 resulted in a file called se_asiax.dat containing 100,198 records, with the same variables listed in step 5.

Actual and potential biomass were each totaled for tropical Southeast Asia from the data sets included with this numeric data package, for comparison with the totals published by Brown et al. (1993). For each data set, the number of pixels with a specific carbon density was multiplied by the carbon density then multiplied by the pixel area to yield total carbon; finally, this product was summed for all carbon densities. For tropical Southeast Asia, estimated total biomass is 42.1 Pg C actual and 73.6 Pg C potential. The same totals were calculated from the 0.25-degree gridded data to be 41.8 Pg C actual and 73.9 Pg C potential. These totals agree with the corresponding values of 42 Pg C actual and 74 Pg C potential reported in Brown et al. (1993), verifying that overall the database included with this numeric data package reflects the data used by the authors in their publication.

As an additional check, the actual biomass carbon density estimates for 1980 in this database can be compared with the carbon content data in Table 5 of NDP-046 (Richards and Flint 1994) for the same year. The 1980 total carbon in forest cover is estimated by Richards and Flint (1994) to be 23.95 Pg C in contrast with 42 Pg C estimated herein. This level of difference is similar to the differences in carbon densities observed in the estimates of Brown et al. (1993) and of Flint and Richards (1994). In addition to the methodological and data-source differences mentioned in Section 3, it must be noted that Richards and Flint (1994), but not Brown et al. (1993), include Singapore, whereas the converse is true for Nepal; furthermore, there are differences between the two databases in terms of the estimated area covered by forests.

5. REFERENCES

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6. HOW TO OBTAIN THE DATA AND DOCUMENTATION

This database (NDP-068) is available free of charge from CDIAC. The files are available from CDIAC's Web site (**http://cdiac.esd.ornl.gov**) or from CDIAC's anonymous FTP (file transfer protocol) area (**cdiac.esd.ornl.gov**) as follows:

1. FTP to cdiac.esd.ornl.gov (128.219.24.36).
2. Enter "ftp" as the user id.
3. Enter your electronic mail address as the password (e.g., fred@zulu.org).
4. Change to the directory "pub/ndp068" (i.e., use the command "cd pub/ndp068").
5. Set ftp to get ASCII files by using the ftp "ascii" command.
6. Retrieve the ASCII database documentation file by using the ftp "get ndp068.txt" command, and retrieve the ASCII data files by using the ftp "mget *.dat" command.
7. Set ftp to get *.e00 data files by using the ftp "binary" command.
8. Retrieve the *.e00 data files by using the ftp "mget *.e00" command.
9. Exit the system by using the ftp "quit" command.

Uncompress the files on your computer, if they are obtained in compressed format.

For **non-Internet data acquisitions** (e.g., floppy diskette or compact disk) or for additional information, contact:

Carbon Dioxide Information Analysis Center
Oak Ridge National Laboratory

P.O. Box 2008
Oak Ridge, Tennessee 37831-6335, U.S.A.

Telephone: 1-865-574-3645
Telefax: 1-865-574-2232
E-mail: cdiac@ornl.gov

7. LISTING OF FILES PROVIDED

This database consists of 37 files: This documentation file (ndp068.txt, File 1), 10 exported ARC/INFO integer grid files, and 26 ASCII data files (Table 3). Five of the 10 exported ARC/INFO grid files have a pixel size of 3.75 km by 3.75 km, whereas the other five have a pixel size of 0.25 degrees by 0.25 degrees. Each core data layer in this database was also grouped into one of five thematic grids (see Sect. 4). The 3.75-km data were aggregated to a resolution of 0.25 degrees; the data at the two levels of resolution contain identical attributes. Each grid when imported into ARC/INFO is an integer grid and contains a value attribute table (vat) and a statistics table (sta). Except for the biomass carbon measures, each grid contains data classes identified by a numeric value code and defined by a character description of the class. Twenty-four of the 26 ASCII data files were generated by using the ARC/INFO GRIDASCII command. As such, these files can be used with or without ARC/INFO software and can be used by raster or vector GIS software packages as well as non-GIS software packages. These 24 files each represent one data item and, when used as a GRID in ARC/INFO, contain the same information found in the 10 ARC/INFO export grids in this numeric data package. The two remaining ASCII data files are aggregates of all the data within this database in ASCII format, one at a spatial resolution of 3.75 km and the other at 0.25 degree. Table 3 describes the files provided in this numeric data package.

Table 3. Files in this numeric data package

File number	File name	File size (kbytes)	File description	Projection type	File type
1	ndp068.txt	94	Descriptive file (i.e., this document)	n/a	ASCII text
2	Biomass.e00	59,468	Exported ARC/INFO gridded (3.75-km) estimates of actual and potential biomass carbon	Albers	ARC/INFO export GRID
3	Biomassx.e00	1,534	Exported ARC/INFO gridded (0.25-degree) estimates of actual and potential biomass carbon	Geographic	ARC/INFO export GRID
4	ac.dat	24,607	ASCII file of ungenerated ARC/INFO gridded (3.75-km) estimates of actual biomass carbon	Albers	GRIDASCII ASCII data file

File number	File name	File size (kbytes)	File description	Projection type	File type
5	acx.dat	593	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) estimates of actual biomass carbon	Geographic	GRIDASCII ASCII data file

Table 3 (continued)

File number	File name	File size (kbytes)	File description	Projection type	File type
6	pc.dat	24,655	ASCII file of ungenerated ARC/INFO gridded (3.75-km) estimates of potential biomass carbon	Albers	GRIDASCII ASCII data file
7	pcx.dat	594	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) estimates of potential biomass carbon	Geographic	GRIDASCII ASCII data file
8	Climate.e00	59,382	Exported ARC/INFO gridded (3.75-km) Weck’s Climatic Index and mean annual precipitation	Albers	ARC/INFO export GRID
9	Climatex.e00	1,448	Exported ARC/INFO gridded (0.25-degree) Weck’s Climatic Index and mean annual precipitation	Geographic	ARC/INFO export GRID
10	climi.dat	23,218	ASCII file of ungenerated ARC/INFO gridded (3.75-km) Weck’s Climatic Index	Albers	GRIDASCII ASCII data file
11	climix.dat	566	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) Weck’s Climatic Index	Geographic	GRIDASCII ASCII data file
12	precip.dat	23,047	ASCII file of ungenerated ARC/INFO gridded (3.75-km) mean annual precipitation	Albers	GRIDASCII ASCII data file

File number	File name	File size (kbytes)	File description	Projection type	File type
13	precipx.dat	562	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) mean annual precipitation	Geographic	GRIDASCII ASCII data file
14	Demog.e00	59,381	Exported ARC/INFO gridded (3.75-km) population density and country name	Albers	ARC/INFO export GRID
15	Demogx.e00	1,449	Exported ARC/INFO gridded (0.25-degree) population density and country name	Geographic	ARC/INFO export GRID

Table 3 (continued)

File number	File name	File size (kbytes)	File description	Projection type	File type
16	pop.dat	22,865	ASCII file of ungenerated ARC/INFO gridded (3.75-km) population density	Albers	GRIDASCII ASCII data file
17	popx.dat	559	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) population density	Geographic	GRIDASCII ASCII data file
18	cntry.dat	23,056	ASCII file of ungenerated ARC/INFO gridded (3.75-km) country name	Albers	GRIDASCII ASCII data file
19	cntryx.dat	563	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) country name	Geographic	GRIDASCII ASCII data file
20	Land.e00	59,401	Exported ARC/INFO gridded (3.75-km) slope, elevation, and soil texture	Albers	ARC/INFO export GRID
21	Landx.e00	1,461	Exported ARC/INFO gridded (0.25-degree) slope, elevation, and soil texture	Geographic	ARC/INFO export GRID
22	slope.dat	22,884	ASCII file of ungenerated ARC/INFO gridded (3.75-km) slope	Albers	GRIDASCII ASCII data file

File number	File name	File size (kbytes)	File description	Projection type	File type
23	slopex.dat	559	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) slope	Geographic	GRIDASCII ASCII data file
24	elev.dat	22,873	ASCII file of ungenerated ARC/INFO gridded (3.75-km) elevation	Albers	GRIDASCII ASCII data file
25	elevx.dat	559	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) elevation	Geographic	GRIDASCII ASCII data file
26	soilt.dat	22,884	ASCII file of ungenerated ARC/INFO gridded (3.75-km) soil texture	Albers	GRIDASCII ASCII data file
27	soiltx.dat	559	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) soil texture	Geographic	GRIDASCII ASCII data file

Table 3 (continued)

File number	File name	File size (kbytes)	File description	Projection type	File type
28	Vegt.e00	59,392	Exported ARC/INFO gridded (3.75-km) forest or non-forest designation, ecofloristic zone, and vegetation type	Albers	ARC/INFO export GRID
29	Vegtx.e00	1,452	Exported ARC/INFO gridded (0.25-degree) forest or non-forest designation, ecofloristic zone, and vegetation type	Geographic	ARC/INFO export GRID
30	forest.dat	22,880	ASCII file of ungenerated ARC/INFO gridded (3.75-km) forest or non-forest designation	Albers	GRIDASCII ASCII data file
31	forestx.dat	559	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) forest or non-forest designation	Geographic	GRIDASCII ASCII data file
32	efz.dat	22,895	ASCII file of ungenerated ARC/INFO gridded (3.75-km) ecofloristic zone	Albers	GRIDASCII ASCII data file
33	efzx.dat	560	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) ecofloristic zone	Geographic	GRIDASCII ASCII data file
34	veg.dat	23,037	ASCII file of ungenerated ARC/INFO gridded (3.75-km) vegetation type	Albers	GRIDASCII ASCII data file
35	vegx.dat	562	ASCII file of ungenerated ARC/INFO gridded (0.25-degree) vegetation type	Geographic	GRIDASCII ASCII data file

Table 3 (continued)

File number	File name	File size (kbytes)	File description	Projection type	File type
36	se_asia.dat	407,372	ASCII file of gridded (3.75-km) grid-cell identification number, longitude and latitude (of the centerpoint of each grid cell), estimate of actual biomass carbon, estimate of potential biomass carbon, Weck's Climatic Index, mean annual precipitation, population density, country name, slope, elevation, soil texture, forest or non-forest designation, ecofloristic zone, and vegetation type	n/a	composite ASCII data file
37	se_asiax.dat	9,780	ASCII file of gridded (0.25-degree) grid-cell identification number, longitude and latitude (of the centerpoint of each grid cell), estimate of actual biomass carbon, estimate of potential biomass carbon, Weck's Climatic Index, mean annual precipitation, population density, country name, slope, elevation, soil texture, forest or non-forest designation, ecofloristic zone, and vegetation type	n/a	composite ASCII data file

Note: GRIDASCII is an ARC/INFO™ command that produces an ASCII file containing data for an individual gridded data layer.

8. DESCRIPTION OF THE DOCUMENTATION FILE

ndp068.txt (File 1)

This file is identical to this document.

9. DESCRIPTION, FORMAT, AND PARTIAL LISTINGS OF THE ARC/INFO GRID FILES

Ten of the 37 files contained within this database are exported ARC/INFO grids. Each exported grid file was generated using the EXPORT command in ARC/INFO with the ‘grid’ and the ‘no data compression’ options (e.g., EXPORT GRID BIOMASS BIOMASS NONE). Five of the exported grid files contain a pixel size of 3.75 km, whereas the other five have a pixel size of 0.25 degrees.

The five 3.75-km ARC/INFO export grids are named BIOMASS, CLIMATE, DEMOG, LAND, and VEGT, and the five 0.25-degree grids are called BIOMASSX, CLIMATEX, DEMOGX, LANDX, and VEGTX. Each grid has been projected into Albers with a unit base of meters by using the following parameters:

```
1st standard parallel:                             30 08 24.000
2nd standard parallel:                             -4 17 24.000
central meridian:                                 107 28 12.000
latitude of projection's origin:                      0 0 0.000
false easting (meters):                                 0.00000
false northing (meters):                                0.00000
```

The five 3.75-km ARC/INFO grids originate at !5879340.56205, !1221655.95152 m and extend to 3863159.43795, 4808344.04848 m; these values are approximately equal to an origin of 44.25875 longitude, !16.52954 latitude and an extent of 149.50875 longitude, 42.97046 latitude. There are 1608 rows and 2598 columns in each grid.

The five 0.25-degree grids originate at 44.25875 degrees longitude, !16.52954 degrees latitude and extend to 149.50875 degrees longitude, 42.97046 degrees latitude. There are 238 rows and 421 columns in each grid.

The 3.75-km grids and the 0.25-degree grids differ only in spatial resolution. The files with an “x” suffix are associated with the aggregated data. For example, BIOMASS and BIOMASSX have exactly the same attributes, as is true for CLIMATE and CLIMATEX, DEMOG and DEMOGX, LAND and LANDX, and VEGT and VEGTX. Table 4 defines the attributes of each grid.

Table 4. Item descriptions for the ten ARC/INFO export grids

3.75-km grid name	0.25-degree grid name	Column	Item name	Input width	Output width	Item type	Variable description
BIOMASS (2,200 records in .vat file)	BIOMASSX (2,209 records in .vat file)	1	Value	4	10	Binary	Unique value for each grid cell
		5	Count	4	10	Binary	Cell count associated with each unique value
		9	ac	4	16	Binary	Actual biomass carbon (Mg C/ha)
		13	pc	4	16	Binary	Potential biomass carbon (Mg C/ha)
CLIMATE (201 records in .vat file)	CLIMATEX (154 records in .vat file)	1	Value	4	10	Binary	Unique value for each grid cell
		5	Count	4	10	Binary	Cell count associated with each unique value
		9	Climi	4	16	Binary	Weck's Climatic Index (code)
		13	precip	4	16	Binary	Mean annual precipitation (code)
		17	climi-c	12	12	Character	Weck's Climatic Index (code definition)
		29	precip-c	12	12	Character	Mean annual precipitation (code definition)
DEMOG (166 records in .vat file)	DEMOGX (147 records in .vat file)	1	Value	4	10	Binary	Unique value for each grid cell
		5	C	4	10	Binary	Cell count associated with each unique value
		9	pop	4	16	Binary	Population density (code)
		13	pop-c	18	18	Character	Population density (code definition)
		31	cntry	4	16	Binary	Country (code)
		35	cntry-c	24	24	Character	Country (code definition)

Table 4 (continued)

3.75-km grid name	0.25-degree grid name	Column	Item name	Input width	Output width	Item type	Variable description
LAND (333 records in .vat file)	LANDX (244 records in .vat file)	1	Value	4	10	Binary	Unique value for each grid cell
		5	C	4	10	Binary	Cell count associated with each unique value
		9	Slope	4	16	Binary	Slope (code)
		13	Elev	4	16	Binary	Mean elevation (code)
		17	Soilt	4	16	Binary	Soil texture (code)
		21	slope-c	18	18	Character	Slope (code definition)
		39	elev-c	18	18	Character	Mean elevation (code definition in meters)
		57	soilt-c	18	18	Character	Soil texture (code definition)
VEGT (258 records in .vat file)	VEGTX (156 records in .vat file)	1	Value	4	10	Binary	Unique value for each grid cell
		5	Count	4	10	Binary	Cell count associated with each unique value
		9	Forest	4	16	Binary	Forest (code)
		13	Forest-c	12	12	Character	Forest (code definition)
		25	efz	4	16	Binary	Ecofloristic zone (code)
		29	efz-c	18	18	Character	Ecofloristic zone (code definition)
		47	veg	4	16	Binary	Vegetation type (code)
		51	veg-c	24	24	Character	Vegetation type (code definition)

The ARC/INFO IMPORT command or the ARCVIEW IMPORT program must be used to read the ten ARC/INFO export grids. The syntax for the ARC/INFO IMPORT command is “IMPORT <option> <interchange_file> <output>” (for example, “IMPORT GRID BIOMASS.E00 BIOMASS”). The syntax for the ARCVIEW IMPORT program is “IMPORT <interchange_file> <output>” (for example, “IMPORT BIOMASS.E00 BIOMASS”). The first and last ten lines of each ARC/INFO exported grid file in this database are as follows:.

Biomass.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/FIXDATA/BIOMASS.E00
GRD  2
      2598      1608 1-0.21474836470000E+10
 0.37500000000000E+04 0.37500000000000E+04
-0.58793405620539E+07-0.12216559515207E+07
 0.38631594379461E+07 0.48083440484793E+07
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
       2193          2         46         221
       2194          1         47         191
       2195          1         48         206
       2196          2         54         191
       2197          3         47         221
       2198          1         55         191
       2199          2         55         206
       2200          2         54       -9999
EOI
```

EOS

Bomassx.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/USE_10_20_00/EXPORT_FILES/BIOMASSX.E00
GRD  2
       421        238 1-0.21474836470000E+10
 0.25000000000000E+00 0.25000000000000E+00
 0.44258748271265E+02-0.16529544598459E+02
 0.14950874827127E+03 0.42970455401541E+02
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
       2202          1        180        352
       2203          1        124        182
       2204          1         86        219
       2205          1         84        248
       2206          1      -9999        219
       2207          1        102        189
       2208          1        123        252
       2209          1      -9999        233
EOI
EOS
```

Climate.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/FIXDATA/NEW_E00/CLIMATE.E00
GRD  2
      2598      1608 1-0.21474836470000E+10
 0.37500000000000E+04 0.37500000000000E+04
-0.58793405620539E+07-0.12216559515207E+07
 0.38631594379461E+07 0.48083440484793E+07
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
        194          3          5         13101-125     5001-11000
        195          6          7         13151-175     5001-11000
        196         26         19          6901-1000    1001-1200
        197         48         18          6801-900     1001-1200
        198         12         20          41001-1700   601-800
        199          6         20          31001-1700   401-600
        200          4         20          61001-1700   1001-1200
        201         20         13          5401-450     801-1000
EOI
EOS
```

Climatex.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/USE_10_20_00/EXPORT_FILES/CLIMATEX.E00
GRD  2
       421        238 1-0.21474836470000E+10
 0.25000000000000E+00 0.25000000000000E+00
 0.44258748271265E+02-0.16529544598459E+02
 0.14950874827127E+03 0.42970455401541E+02
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
        147          4         20      -9999             1001-1700
        148          1          9         13201-250     5001-11000
        149          1         18          6801-900     1001-1200
        150          2         14          6451-500     1001-1200
        151          1      -9999          6             1001-1200
        152          1         12          5351-400     801-1000
        153          2         13          6401-450     1001-1200
        154          1      -9999          5             801-1000
EOI
EOS
```

Demog.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/FIXDATA/DEMOG.E00
GRD  2
      2598      1608 1-0.21474836470000E+10
 0.37500000000000E+04 0.37500000000000E+04
-0.58793405620539E+07-0.12216559515207E+07
 0.38631594379461E+07 0.48083440484793E+07
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
        163       7777         10501-750                        13INDONESIA

        164        124          8301-400                        13INDONESIA

        165       2078          6151-200                        13INDONESIA

        166         38         11751-1000                       13INDONESIA

EOI
EOS
```

Demogx.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/USE_10_20_00/EXPORT_FILES/DEMOGX.E00
GRD  2
       421       238 1-0.21474836470000E+10
 0.25000000000000E+00 0.25000000000000E+00
 0.44258748271265E+02-0.16529544598459E+02
 0.14950874827127E+03 0.42970455401541E+02
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
       144         31          9401-500                       13INDONESIA

       145          2          8301-400                       13INDONESIA

       146         48          7201-300                       13INDONESIA

       147         41          6151-200                       13INDONESIA

EOI
EOS
```

Land.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/FIXDATA/NEW_E00/LAND.E00
GRD  2
      2598      1608 1-0.21474836470000E+10
 0.37500000000000E+04 0.37500000000000E+04
-0.58793405620539E+07-0.12216559515207E+07
 0.38631594379461E+07 0.48083440484793E+07
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
        330          5          4          3      -9999HILLY            501-100
                                                                              0
        331          1          4          6          4HILLY           2001-25
00          MEDIUM FINE
        332          1          4          4      -9999HILLY           1001-15
                                                                              0
        333          1      -9999          4          1                1001-15
00          COARSE
EOI
EOS
```

Landx.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/USE_10_20_00/EXPORT_FILES/LANDX.E00
GRD  2
       421       238 1-0.21474836470000E+10
 0.25000000000000E+00 0.25000000000000E+00
 0.44258748271265E+02-0.16529544598459E+02
 0.14950874827127E+03 0.42970455401541E+02
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
        241          2          4          4          1HILLY              1001-15
00         COARSE
        242          1          3          6          4ROLLING            2001-25
00         MEDIUM FINE
        243          1          4          1      -9999HILLY              0-250

        244          1          5          2      -9999MOUNTAINOUS        251-500

EOI
EOS
```

Vegt.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/FIXDATA/NEW_E00/VEGT.E00
GRD  2
      2598      1608 1-0.21474836470000E+10
 0.37500000000000E+04 0.37500000000000E+04
-0.58793405620539E+07-0.12216559515207E+07
 0.38631594379461E+07 0.48083440484793E+07
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
        255          2      -9999                      3LOWLAND SEASONAL
   18WATERBODIES
        256          2          2NON-FOREST            4LOWLAND DRY
   18WATERBODIES
        257          2          1FOREST                4LOWLAND DRY
-9999
        258         15      -9999                      3LOWLAND SEASONAL
   13LOWLAND MONSOON FOREST
EOI
EOS
```

Vegtx.e00

First 10 lines:

```
EXP  0 /DATA4/OZ1/CDIAC/SE_ASIA/USE_10_20_00/EXPORT_FILES/VEGTX.E00
GRD  2
       421        238 1-0.21474836470000E+10
 0.25000000000000E+00 0.25000000000000E+00
 0.44258748271265E+02-0.16529544598459E+02
 0.14950874827127E+03 0.42970455401541E+02
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
   -2147483647   -2147483647   -2147483647   -2147483647   -2147483647
```

Last 10 lines:

```
       153          1          2NON-FOREST             6MONTANE MOIST
   13LOWLAND MONSOON FOREST
       154          1          2NON-FOREST             3LOWLAND SEASONAL
   15MANGROVES
       155          1      -9999                       4LOWLAND DRY
   17NON-FOREST (INSUL)
       156          1      -9999                       3LOWLAND SEASONAL
   15MANGROVES
EOI
EOS
```

10. DESCRIPTION, FORMAT, AND PARTIAL LISTINGS OF THE 24 ASCII DATA FILES PRODUCED BY THE ARC/INFO GRIDASCII COMMAND

Twenty-four of the 26 ASCII data files included in this numeric data package were generated by the ARC/INFO GRIDASCII command. These files may be used with or without ARC/INFO software. The ASCIIGRID command must be used to read these files into ARC/INFO. The syntax for the ASCIIGRID command is "ASCIIGRID <in_ascii_file> <out_grid> {INT | FLOAT}" (e.g., ASCIIGRID AC.DAT AC INT).

The first six lines of each file contain header information. The first line gives the number of columns, and the second gives the number of rows. The third and fourth lines define the lower left-hand *x* (longitude) coordinate and the lower left-hand *y* (latitude) coordinate. The fifth line defines the size of each grid cell, and the final line defines the missing-value indicator used in the file. For example, the files ac.dat, pc.dat, elev.dat, climi.dat, precip.dat, pop.dat, cntry.dat, slope.dat, soilt.dat, forest.dat, efz.dat, and veg.dat each contain the following as their first six lines (lines 1 to 6):

```
ncols          2598
nrows          1608
xllcorner      -5879340.5620539
yllcorner      -1221655.9515207
cellsize       3750
NODATA_value   -9999
```

The remaining 1608 lines of data contain 2598 values, one value for each grid cell. For example, the file forest.dat contains 2598 values that are 1, 2, or –9999, identifying forest, non-forest, or unknown in each of the remaining 1608 lines in the file. Each file has a total of 1614 lines and a maximum line length of 15,587 characters.

These files may also be read using the following Fortran or SAS statements:

Fortran:

```
Dimension ia(2598)
Open (10, file='path_and_filename',status='old')
Do I=1,6
Read(10,*)
Enddo
Do I=1,1608
Read(10,*) (ia(j),j=1,2598)
911 continue
write (12,*)
enddo
stop
end
```

SAS:

```
Data in;
Infile 'path and file name' firstobs=7 linesize=15587;
Input varname@@;
Run;
```

Each file should have 4,177,584 records when this SAS input routine is used.

Files acx.dat, pcx.dat, elevx.dat, climix.dat, precipx.dat, popx.dat, cntryx.dat, slopex.dat, soiltx.dat, forestx.dat, efzx.dat, and vegx.dat each contain the following as their first six lines (lines 1 to 6):

```
ncols          421
nrows          238
xllcorner      44.258748271265
yllcorner      -16.529544598459
cellsize       0.025
NODATA_value   -9999
```

The remaining 238 lines of data in each file (lines 7 to 244) contain 421 values for the variable in the file. For example, the file forestx.dat contains 421 values that are either 1, 2, or –9999, identifying forest, non-forest, or unknown in each of the remaining 238 lines in the file. Each file has a total of 244 lines and a maximum line length of 2525 characters.

These files may also be read by using the following Fortran or SAS statements:

Fortran:

```
Dimension ia(421)
Open (10, file='path_and_filename',status='old')
Do I=1,6
Read(10,*)
Enddo
Do I=1,238
Read(10,*) (ia(j),j=1,421)
912 continue
write (12,*)
enddo
stop
end
```

SAS:

```
Data in;
Infile 'path and file name' firstobs=7 linesize=2525;
Input varname@@;
Run;
```

Each file should have 100,198 records when this SAS input routine is used.

All the data values in climi.dat, climix.dat, precip.dat precipx.dat, pop.dat, popx.dat, cntry.dat, cntryx.dat, slope.dat, slopex.dat, elev.dat, elevx.dat, soilt.dat, soiltx.dat, forest.dat, forestx.dat, efz.dat, efzx.dat, veg.dat, and vegx.dat are integers. Each value has a corresponding character definition, according to the following specification:

CNTRY	CNTRY-C (country name)
1	Bangladesh
2	Burma
3	India
4	Cambodia
5	Laos
6	Malaysia (Peninsular)
7	Nepal
8	Pakistan*
9	Sri Lanka
10	Thailand
11	Vietnam
12	Malaysia (Insular)
13	Indonesia
14	Philippines
15	Papua New Guinea*
16	Brunei

*Although there are no data included in this database for Pakistan and Papua New Guinea, some border cells may be classified as such, as a result of the rasterization process (see Sect. 3, Data Limitations and Restrictions).

EFZ	EFZ-C (ecofloristic zone)
2	Lowland moist
3	Lowland seasonal
4	Lowland dry
6	Montane moist
7	Montane seasonal
9	Non-forest

VEG	VEG-C (vegetation type)
1	Closed forest
2	Secondary forest
3	Shifting cultivation
4	Open forest
5	Forest mosaic
6	Non-forest (Continental)
11	Lowland rain forest
12	Montane rain forest
13	Lowland monsoon forest
14	Montane monsoon forest
15	Mangroves
16	Inland swamp forest
17	Non-forest (Insular)
18	Waterbodies
19	Degraded rain forest
20	Degraded monsoon forest

POP	POP-C (population density in people/km^2)
1	1 to 25
2	26 to 50
3	51 to 75
4	76 to 100
5	101 to 150
6	151 to 200
7	201 to 300
8	301 to 400
9	401 to 500
10	501 to 750
11	751 to 1000
12	1000 to 1500
13	1500 to 2000
14	2001 to 25000

PRECIP	PRECIP-C (mean annual precipitation in mm/yr)
1	1 to 200
2	201 to 400
3	401 to 600
4	601 to 800
5	801 to 1000
6	1001 to 1200
7	1201 to 1600
8	1601 to 2000
9	2001 to 2500
10	2501 to 3000
11	3001 to 4000
12	4001 to 5000
13	5001 to 11000

ELEV	ELEV-C (elevation in m)
1	0 to 250
2	251 to 500
3	501 to 1000
4	1001 to 1500
5	1501 to 2000
6	2001 to 2500
7	2501 to 3000
8	3001 to 4000
9	4001 to 5000
10	5001 to 10000

SLOPE	SLOPE-C (slope)
1	Level
2	Undulating
3	Rolling
4	Hilly
5	Mountainous
6	Unknown

SOILT	SOILT-C (soil texture)
1	Coarse
2	Medium coarse
3	Medium
4	Medium fine
5	Fine
6	Unknown

FOREST	FOREST-C (forest or non-forest designation)
1	Forest
2	Non-forest

CLIMI	CLIMI-C (Weck's Climatic Index)
1	1 to 25
2	26 to 50
3	51 to 75
4	76 to 100
5	101 to 125
6	126 to 150
7	151 to 175
8	176 to 200
9	201 to 250
10	251 to 300
11	301 to 350
12	351 to 400
13	401 to 450
14	451 to 500
15	501 to 600
16	501 to 700
17	701 to 800
18	801 to 900
19	901 to 1000
20	1001 to 1700

11. DESCRIPTION, FORMAT, AND PARTIAL LISTING OF THE COMPOSITE 3.75-KM AND 0.25-DEGREE ASCII DATA FILES

The final two ASCII data files included in this numeric data package contain a composite of all the data in each of the 24 ASCII data files produced by the ARC/INFO GRIDASCII command. Each file contains the following variables: grid-cell identification number, longitude of the centerpoint of each grid cell, latitude of the centerpoint of each grid cell, estimated actual biomass carbon density in Mg/ha, estimated potential biomass carbon density in Mg/ha, country name, Weck's Climatic Index, ecofloristic zone, elevation, forest or non-forest designation, population density, mean annual precipitation, slope, soil texture, and vegetation type. The first file, se_asia.dat, contains data at 3.75-km spatial resolution, whereas se_asiax.dat contains the same data at 0.25-degree spatial resolution. While each file contains 15 variables, se_asia.dat has 4,177,584 records, and se_asiax.dat has 100,198 records. Table 5 describes the format and content of the two files.

Table 5. Format and description of variables for the composite ASCII data files in this numeric data package (se_asia.dat and se_asiax.dat)

Start column	End column	Variable name	Variable description
1	7	gid	Unique grid-cell identification number. Values range from 1, for the lower-left-most grid cell, to to 4,177,584 (in file se_asia.dat) or 100,198 (in file se_asiax.dat), for the upper-right-most grid cell
9	16	long	Longitude (decimal degrees) of the centerpoint of each 3.75-km (in file se_asia.dat) or 0.25-degree (in file se_asiax.dat) grid cell
18	25	lat	Latitude (decimal degrees) of the centerpoint of each 3.75-km (in file se_asia.dat) or 0.25-degree (in file se_asiax.dat) grid cell
27	31	ac	Actual biomass carbon density in Mg/ha
33	37	pc	Potential biomass carbon density in Mg/ha
39	43	cntry	Country code
45	49	climi	Weck's Climatic Index code
51	55	efz	Ecofloristic zone code
57	61	elev	Mean elevation code
63	67	forest	Forest or non-forest code
69	73	pop	Population density code
75	79	precip	Mean annual precipitation code
81	85	slope	Slope code
87	91	soilt	Soil texture code
93	97	veg	Vegetation code

The following listing provides the first and last ten lines of the two composite ASCII data files (se_asia.dat and se_asiax.dat).

se_asia.dat

First 10 lines:

```
1       44.2828  36.2251  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
2       44.3217  36.2333  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
3       44.3605  36.2416  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4       44.3994  36.2498  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
5       44.4382  36.258   -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
6       44.4771  36.2663  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
7       44.5159  36.2745  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
8       44.5548  36.2827  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
9       44.5936  36.2909  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
10      44.6325  36.2991  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
```

Last 10 lines:

```
4177575 140.9362 -13.3889 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177576 140.9686 -13.3934 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177577 141.0011 -13.3978 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177578 141.0335 -13.4023 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177579 141.066  -13.4068 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177580 141.0984 -13.4113 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177581 141.1308 -13.4158 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177582 141.1633 -13.4203 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177583 141.1957 -13.4248 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4177584 141.2282 -13.4293 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
```

se_asiax.dat

First 10 lines:

```
1       44.3837  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
2       44.6337  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
3       44.8837  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
4       45.1337  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
5       45.3837  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
6       45.6337  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
7       45.8837  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
8       46.1337  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
9       46.3837  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
10      46.6337  42.8455  -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
```

Last 10 lines:

```
100189  147.1337 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100190  147.3837 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100191  147.6337 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100192  147.8837 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100193  148.1337 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100194  148.3837 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100195  148.6337 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100196  148.8837 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100197  149.1337 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
100198  149.3837 -16.4045 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999 -9999
```

The following statements can be used to read ASCII data files into Fortran or SAS programs:

For Fortran:

```
10 READ(5,100, END=999)gid,longitud,latitude,ac,pc,cntry,climi,efz,elev,
 1 forest pop precip slope soilt veg
100 FORMAT(i8,2f8.2,12i8)
```

For SAS:

```
Data in;
Infile 'path and filename' linesize=97 DLM=",";
Input gid longitud latitude ac pc cntry climi efz elev forest pop precip
   slope soilt veg;
Run;
```

12. STATISTICS OF THE FILES PROVIDED IN THIS NUMERIC DATA PACKAGE

The statistics that follow in Table 6 are presented only as a tool to ensure the proper reading of the 36 data files in this numeric data package. The statistics given for the ten ARC/INFO export grid files are identical to the contents of the statistical attribute table (gridname.sta) for each imported ARC/INFO grid. The 26 ASCII data files were generated after all occurrences of –9999 (missing-value indicator) were excluded. These statistics should not be interpreted as a summary of these data nor as an indicator of trends in these data.

Table 6. Item statistics for the data files in this numeric data package

File name	Cell size	Number of columns	Number of rows	Number of records	Number of unique values	Item(s)	Minimum	Maximum	Mean	Standard deviation
Biomass.e00	3.75 km	2598	1608	n/a	2200	ac,pc	1	2200	270.32	503.09
Biomassx.e00	0.25 deg	421	238	n/a	2209	ac,pc	1	2209	376.30	636.81
ac.dat	3.75 km	2598	1608	1614	281	ac	7	383	145.17	61.72
acx.dat	0.25 deg	421	238	244	279	ac	7	336	143.33	61.28
pc.dat	3.75 km	2598	1608	1614	30	pc	14	393	255.16	68.71
pcx.dat	0.25 deg	421	238	244	288	pc	43	402	253.57	68.73
Climate.e00	3.75 km	2598	1608	n/a	201	climi, precip	1	201	67.92	38.40
Climatex.e00	0.25 deg	421	238	n/a	154	climi, precip	1	154	57.46	35.34
climi.dat	3.75 km	2598	1608	1614	20	climi	1	20	11.67	6.06
climix.dat	0.25 deg	421	238	244	20	climi	1	20	11.49	6.07
precip.dat	3.75 km	2598	1608	1614	13	precip	1	13	7.64	2.40
precipx.dat	0.25 deg	421	238	244	13	precip	1	13	7.57	2.42
Demog.e00	3.75 km	2598	1608	n/a	166	pop, cntry	1	166	63.65	57.47
Demogx.e00	0.25 deg	421	238	n/a	147	pop, cntry	1	147	54.65	52.70
pop.dat	3.75 km	2598	1608	1614	14	pop	1	14	4.20	2.86
popx.dat	0.25 deg	421	238	244	14	pop	1	14	4.24	2.86
cntry.dat	3.75 km	2598	1608	1614	16	cntry	1	16	6.94	4.67

Table 6 (continued)

File name	Cell size	Number of columns	Number of rows	Number of records	Number of unique values	Item(s)	Minimum	Maximum	Mean	Standard deviation
cntryx.dat	0.25 deg	421	238	244	15	cntry	1	16	6.83	4.64
Land.e00	3.75 km	2598	1608	n/a	333	slope, elev, soilt	1	333	159.97	56.40

File name	Cell size	Number of columns	Number of rows	Number of records	Number of unique values	Item(s)	Minimum	Maximum	Mean	Standard deviation
Landx.e00	0.25 deg	421	238	n/a	244	slope, elev, soilt	1	244	96.43	44.19
slope.dat	3.75 km	2598	1608	1614	6	slope	1	6	2.78	1.71
slopex.dat	0.25 deg	421	238	244	6	slope	1	6	2.78	1.71
elev.dat	3.75 km	2598	1608	1614	10	elev	1	10	2.15	1.37
elevx.dat	0.25 deg	421	238	244	10	elev	1	10	2.18	1.72
soilt.cat	3.75 km	2598	1608	1614	6	soilt	1	6	3.25	1.40
soiltx.dat	0.25 deg	421	238	244	6	soilt	1	6	3.23	1.40
Vegt.e00	3.75 km	2598	1608	n/a	258	forest, efz, veg	1	258	70.40	55.49
Vegtx.e00	0.25 deg	421	238	n/a	156	forest, efz, veg	1	156	44.51	38.83
forest.dat	3.75 km	2598	1608	1614	2	forest	1	2	1.59	0.49
forestx.dat	0.25 deg	421	238	244	2	forest	1	2	1.60	0.49
efz.dat	3.75 km	2598	1608	1614	6	efz	2	9	3.29	1.56
efzx.dat	0.25 deg	421	238	244	6	efz	2	9	3.32	1.59
veg.dat	3.75 km	2598	1608	1614	16	veg	1	20	7.59	4.87
vegx.dat	0.25 deg	421	238	244	16	veg	1	20	7.49	4.80
se_asia.dat	3.75 km	97	4177584	4177584	4177584	gid	1	4177584	2088792.50	1205964.77
					4177584	longitud	44.28	149.42	97.71	27.39
					4177584	latitude	-16.51	42.99	14.25	15.35
					281	ac	7	383	145.17	61.72
					30	pc	14	393	255.16	68.71
					20	climi	1	20	11.67	6.06
					13	precip	1	13	7.61	2.40
					14	pop	1	14	4.20	2.86
					16	cntry	1	16	6.94	4.67
					6	slope	1	6	2.78	1.71
					10	elev	1	10	2.15	1.67
					6	soilt	1	6	3.25	1.40
					2	forest	1	2	1.59	0.49
					6	efz	2	9	3.29	1.56
					16	veg	1	20	7.59	4.87

Table 6 (continued)

File name	Cell size	Number of columns	Number of rows	Number of records	Number of unique values	Item(s)	Minimum	Maximum	Mean	Standard deviation
se_asiax.dat	0.25 deg	97	100198	100198	100198	gid	1	100198	50099.50	28924.82
					100198	longitud	44.38375	149.3837	96.88	30.38
					100198	latitude	-16.40454	42.84546	13.22	17.18
					279	ac	7	336	143.33	61.28
					288	pc	43	402	253.57	68.73
					20	climi	1	20	11.49	6.07
					13	precip	1	13	7.57	2.42
					14	pop	1	14	4.24	2.86
					16	cntry	1	16	6.83	4.64
					6	slope	1	6	2.78	1.71
					10	elev	1	10	2.18	1.72
					6	soilt	1	6	3.23	1.40
					2	forest	1	2	1.60	0.49
					6	efz	2	9	3.32	1.59
					16	veg	1	20	7.46	4.80