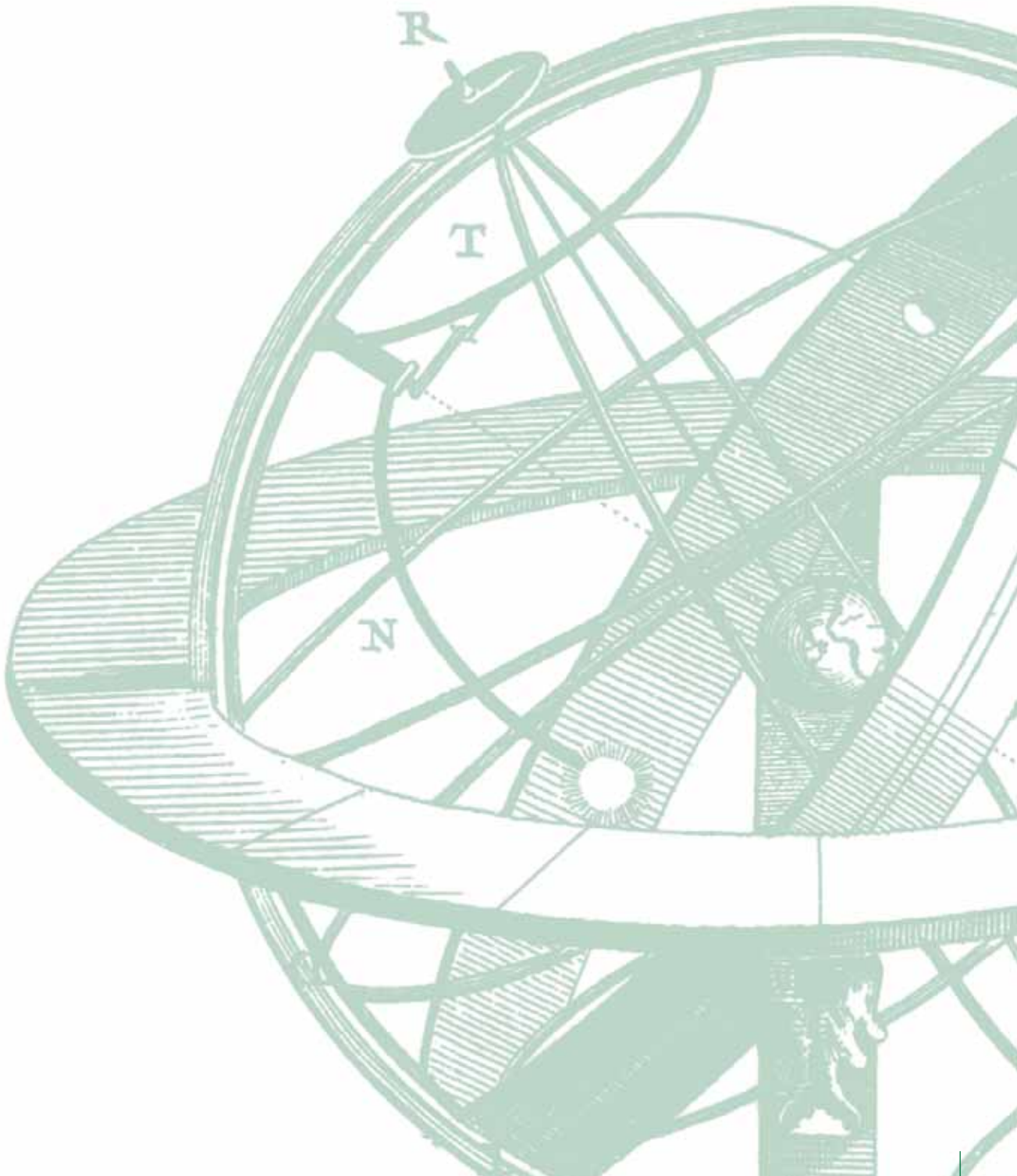


ANNEX

1

DEFINITIONS AND CONVERSION FACTORS



DEFINITIONS OF MAIN TERMS

Definitions are taken from the Unified Bioenergy Terminology (UBET) (FAO, 2004c).

- Wood energy systems** = All the (steps and/or) unit processes and operations involved for the production, preparation, transportation, marketing, trade and conversion of woodfuels into energy.
- Woodfuel** = All types of biofuels originating directly or indirectly from woody biomass. This category includes fuelwood, charcoal and black liquor (the latter being not significant in the context of this study since its cycle is entirely within the paper industry)
- Fuelwood** = Woodfuel where the original composition of the wood is preserved. This category includes wood in the raw and also residues from wood processing industries.
- Charcoal** = Solid residue derived from carbonization, distillation, pyrolysis and torrefaction of fuelwood.

Basic parameters and conversion factors:

Wood – Net Calorific Value (30 percent moisture content, dry basis)	13.8 MJ/kg
Charcoal – Net Calorific Value (5 percent moisture content, dry basis)	30.8 MJ/kg
Charcoal/fuelwood	165 kg charcoal/m ³
Wood density (air-dry)	725 kg/m ³
Wood density (oven-dry)	593 kg/m ³

See also main factors applied and relevant references in Annex 2.

ANNEX

2

SUPPLY MODULE. WOODY BIOMASS STOCKING, PRODUCTIVITY AND REFERENCES

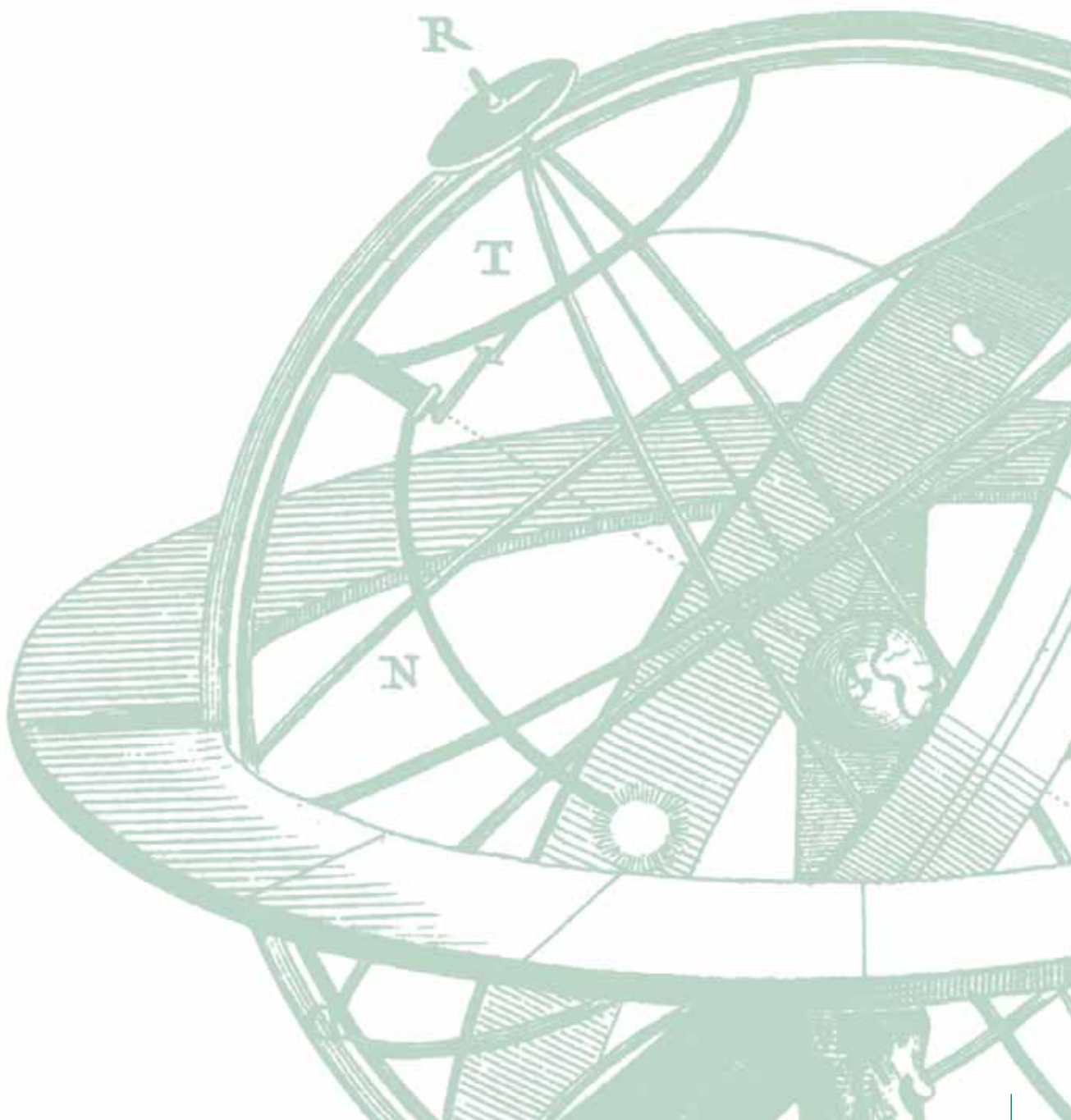


TABLE A.2.1

Stem volume over bark of trees with DBH > 10 cm. Volume expressed as m³/ha

	1	2	4	7	8	9	11	12	13	14	15	16	17	18	19	20	21	22	
Tropical rain-forest 11-TAr	max	241	124			61													
	mean	135	83	103	30	30	44	29	15	15	15	5	10	10	2				
	min	68	41			15	18												
Tropical rain-forest, equatorial 10-TAr_Eq	max	318			180	180	106	54	27	27	27	9	18	18	5				
	mean	245				82	54	54	27	27	27	9	18	18	5				
	min	164				55													
Tropical mountain system, equatorial 5-EqM	max	318			180	180	106	54	27	27	27	9	18	18	5				
	mean	245				82	54	54	27	27	27	9	18	18	5				
	min	164				55													
Tropical mountain system 16-TM	max	93				31													
	mean	69	66	90		23	15	15	8	8	8	3	5	5	1				
	min	31				10													
Tropical moist deciduous forest 12-TAWa	max	140	111	173		42													
	mean	83	66	78		24	16	16	8	8	8	3	5	5	1				
	min	48	31	60		13													
Tropical dry forest 13-TAWb	max	110	99			35													
	mean	74	56		20	21	14	14	7	7	7	2	5	5	1				
	min	48	29			15	13												
Tropical shrubland 14-TBSH	max	110	99			35													
	mean	74	56		20	21	14	14	7	7	7	2	5	5	1				
	min	48	29			15	13												
Subtropical humid forest 21-SCf	max			173		58													
	mean	90	31	97		31	21	21	10	10	10	3	7	7	2				
	min			60		20													
Subtropical mountain system 25-SM	max	90		90		30	20	20	10	10	10	3	7	7	2				
	mean																		
	min																		

Note: numbers in header are class codes.

TABLE A.2.2

Woody biomass suitable as fuelwood or wood for charcoal production, expressed as t/ha

	1	2	4	7	8	9	11	12	13	14	15	16	17	18	19	20	21	22	
Tropical rain-forest 11-TAr	max	254	183			121													
	mean	190	150	70	47	47	43	43	21	21	21	7	14	14	4				4
	min	136	64			24	27												
Tropical rain-forest, equatorial 10-TAr_Eq	max	291			220	160													
	mean	256			220	140	80	80	40	40	40	13	27	27	7				7
	min	210				81													
Tropical mountain system, equatorial 5-EqM	max	291			220	160													
	mean	256			220	140	80	80	40	40	40	13	27	27	7				7
	min	210				81													
Tropical mountain system 16-TM	max	159				46													
	mean	137	134	61		34	22	22	11	11	11	4	7	7	2				2
	min	48				15													
Tropical moist deciduous forest 12-TAwa	max	194	173	117		62													
	mean	150	134	53		36	24	24	12	12	12	4	8	8	2				2
	min	75	48	41		19													
Tropical dry forest 13-TAwb	max	172	163			51													
	mean	142	88		31	30	20	20	10	10	10	3	7	7	2				2
	min	75	45			19													
Tropical shrubland 14-TBSh	max	172	163			51													
	mean	142	88		31	30	20	20	10	10	10	3	7	7	2				2
	min	75	45			19													
Subtropical humid forest 21-SCf	max	156	156	117		85													
	mean	156	156	66		46	30	30	15	15	15	5	10	10	3				3
	min			41		30													
Subtropical mountain system 25-5M	max	156	156	61		44	29	29	15	15	15	5	10	10	2				2
	mean	156	156	61		44	29	29	15	15	15	5	10	10	2				2
	min																		

Note: numbers in header are class codes.

TABLE A.2.3

Estimated productivity (as a percentage of stock)

	1	2	4	7	8	9	11	12	13	14	15	16	17	18	19	20	21	22
Tree cover, broadleaved, evergreen	1	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Tree cover, broadleaved, deciduous	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tree cover, flooded, regularly flooded, fresh water	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Tree cover, regularly flooded saline water	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Tree cover, regularly flooded, evergreen	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Tree cover, regularly flooded, deciduous	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Tree cover, regularly flooded, evergreen	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Tree cover, regularly flooded, deciduous	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Tree cover, regularly flooded, evergreen	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Tree cover, regularly flooded, deciduous	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Tree cover, regularly flooded, evergreen	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Tree cover, regularly flooded, deciduous	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Tree cover, regularly flooded, evergreen	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Tree cover, regularly flooded, deciduous	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Tree cover, regularly flooded, evergreen	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Tree cover, regularly flooded, deciduous	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Tree cover, regularly flooded, evergreen	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Tree cover, regularly flooded, deciduous	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Tree cover, regularly flooded, evergreen	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Tree cover, regularly flooded, deciduous	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Tree cover, regularly flooded, evergreen	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Tree cover, regularly flooded, deciduous	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22

Note: column numbers in header are class codes.

TABLE A.2.4

Main factors applied and related references

Item	Factors	Notes	References
Wood density	0.725 0.593	t/m ³ t/m ³	Standard FAO wood density value at 12 percent moisture Calculated from Reyes et al. (1992) using formula: oven-dry = 0.0134+0.8*(biomass at 12 percent moisture)
Biomass expansion factor (BEF)	EXP(3.213 - 0.506 * L _n (VOB ₁₀)) 1.74	for BV < 190 (BV = VOB ₁₀ * oven-dry WD) for BV > 190	FAO, 1997b – see Equation 3.1.4 on page 8
Open broad-leaf formations (VOB ₁₀ < 60)	3.0		S. Brown, pers. comm. Brown and Lugo, 1984.
Coniferous forests	1.3		FAO, 1997b.
Volume expansion factor (VEF) from VOB ₃₀ to VOB ₁₀	Exp(1.3 - 0.209 * L _n (VOB ₃₀)) 1.3	for VOB ₃₀ < 250 m ³ /ha (VOB ₃₀ = volume over bark of free bole of trees with DBH > 30 cm) for VOB ₃₀ > 250 m ³ /ha	FAO, 1997b.
Woodfuel fraction (WFF)	0.88	for denser forest formations (classes 1 to 8)	S. Brown, pers. comm., 2005. Brown and Lugo, 1990.
Fraction of total aboveground biomass suitable as woodfuel	0.83	for open formations (classes 9 to 23)	Gurumurti, Raturi and Bhandari, 1984. Ketterings et al., 2001. Negi et al., 1984.

Key to acronyms: BV = biomass of inventoried volume in t/ha, calculated as the product of VOB/ha (m³/ha) and wood density (WD) (t/m³). L_n = natural logarithm.

TABLE A 2.5

Main references sources for volumes of forest formations

Ecozone	Country	References
Tropical rainforest (a)	Malaysia	For evergreen: Fourth National Forest Inventory for Peninsular Malaysia 2001-2003. From FRA 2005 country report. For swamp forest: Forestry and forest industries development. A National Forest Inventory of West Malaysia 1970-1972. FO:DP/MAL/72/009. Technical Report 5. Rome.
Tropical rainforest (b)	Thailand Myanmar	Thailand Forest Inventory data (FAO FRA Documentation) Evergreen forest: Inventory of Kunchaung Forest Reserve from: Thang H. C. 1992. Review of the evergreen forest management system in Myanmar. FAO MYA/85/003. For deciduous and sparse trees: Burma National forest inventory. Summaries of 7 units . FAO WP 5, 7, 8-12. Inventories 1982-83 in Pegu Province.
	Lao PDR Viet Nam Cambodia	FRA 2000 country report; tentative allocation by ecozone FRA 2000 country report; tentative allocation by ecozone Data reported in Field Document No. 10 of project CMB 95/002: Report on establishment of a forest resources inventory process in Cambodia. [Results refer to dense forest]
Tropical mountain system (a)	Malaysia	Forest Survey of the Lowlands West of the Cardamomes Mountains, 1967 (Reported in FAO, 1971).
Tropical mountain system (b)	Thailand Lao PDR Viet Nam	For evergreen: Fourth National Forest Inventory for Peninsular Malaysia 2001-2003. From FRA 2005 country report. Thailand Forest Inventory data (FAO FRA Documentation) FRA 2000 country report; tentative allocation by ecozone FRA 2000 country report; tentative allocation by ecozone
Tropical moist deciduous forest	Thailand Lao PDR Cambodia	Thailand Forest Inventory data (FAO FRA Documentation) FRA 2000 country report; tentative allocation by ecozone Data reported in Field Document No. 10 of project CMB 95/002: Report on establishment of a forest resources inventory process in Cambodia. [Results refer to dense forest conditions; over 80 percent of areas have crown cover >70 percent]
Tropical dry forest	Viet Nam Thailand Cambodia	FRA 2005 country report estimate for lower range of mixed evergreen-deciduous forests. FRA 2000 country report; tentative allocation by ecozone Thailand Forest Inventory data (FAO FRA Documentation) Data reported in Field Document No. 10 of project CMB 95/002: Report on establishment of a forest resources inventory process in Cambodia. [Results refer to dense forest conditions; over 80 percent of areas have crown cover >70 percent]
Tropical shrubland		FRA 2005 country report estimate for average deciduous forests.
Subtropical humid forest	Viet Nam	Marginal area in SE Viet Nam. Values assumed equal to Tropical Dry Forest
Subtropical mountain system	Yunnan (Prov. China)	FRA 2000 country report; tentative allocation by ecozone White Book China Forest Resources Report (2005) published by State Forestry Administration, P.R.C World Bank. Forest resource development and protection project. Staff appraisal report 12762-CHA, 1994

TABLE A 2. 6

Other reference sources

	References
Non-forest sources of woody biomass	Forestry Sector Outlook Study, 1997. Wood Materials from Non-Forest Areas. Prepared by N. Vergara, Asia-Pacific Forestry Sector Outlook Study Working Paper No. APFOS/WPI/19. Pandey D., 2002. in Trees outside forests. Towards better awareness. <i>FAO Conservation Guide</i> 35. Anonymous. 2000. Woodfuel from non-forest areas. <i>Wood Energy News</i> , 15(1).
Mean Annual Increment (MAI)	D. Alder. 1983. Growth and yield of mixed tropical forests. Unpublished FAO consultancy report. Bedel, F., Durrieu de Madron, L., Dupuy, B., Favrichon, V., Maître, H.-F., Bar-Hen, A. & Narbonni, P. 1998. Dynamique de croissance dans des peuplements exploités et éclaircis de forêt dense africaine. Dispositif de M'Baiki en République Centrafricaine (1982-1995). CIRAD, Montpellier, France. Document Forafri, 1. 72 p. Fourth National Forest Inventory for Peninsular Malaysia 2001-2003. From FRA 2005 country report. FAO/RWEDP. 1997b. Data Collection and Analysis for Area-Based Energy Planning. A Case Study in Phrao District, Northern Thailand. Prepared by J. Siteur. RWEDP Field Document, No. 48 World Bank. 1992. Background report on biomass sector. Prepared by P. Ryan for <i>Wood Energy in Myanmar</i> . RWEDP Report, No. 33. World Bank. 1996. Cambodia forest policy assessment. World bank Report 15777-KH.

ANNEX

3

PROTECTED
AREAS

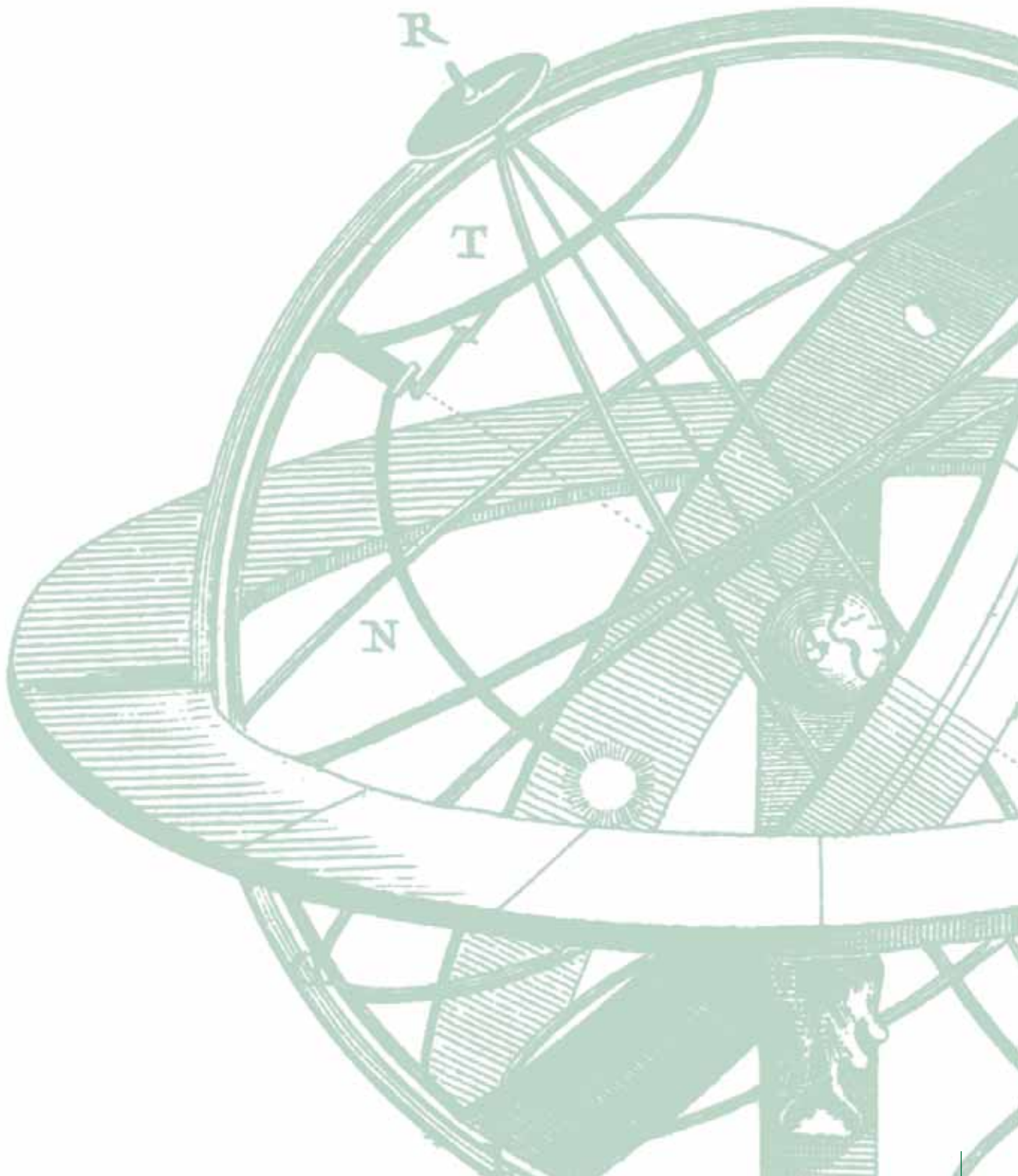
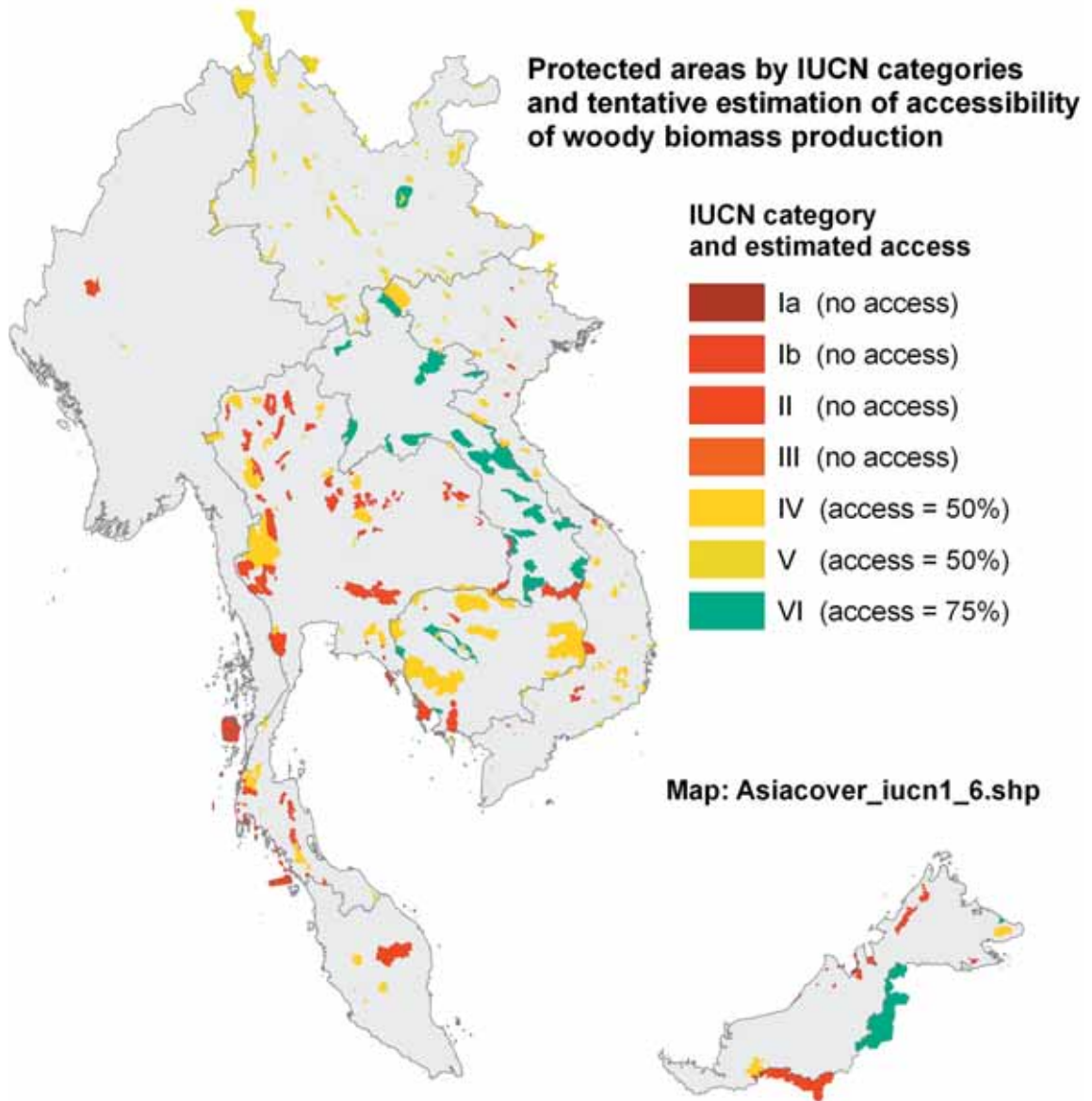


FIGURE A31

Protected areas by IUCN categories and tentative estimation of accessibility of woody biomass production



PROTECTED AREA MANAGEMENT CATEGORIES

IUCN has defined a series of six protected area management categories, based on primary management objective. These are summarized in Table A3.1.

TABLE A3.1

Summary descriptions of IUCN Protected Area Management Categories

Category	Description
Ia	Strict Nature Reserve: protected area managed mainly for science Definition: Area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
Ib	Wilderness Area: protected area managed mainly for wilderness protection Definition: Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.
II	National Park: protected area managed mainly for ecosystem protection and recreation Definition: Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
III	Natural Monument: protected area managed mainly for conservation of specific natural features Definition: Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.
IV	Habitat/Species Management Area: protected area managed mainly for conservation through management intervention Definition: Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.
V	Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation Definition: Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
VI	Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems Definition: Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

These categories are defined in detail in the *Guidelines for Protected Areas Management Categories* published by IUCN in 1994.

ANNEX

4

DEMAND MODULE. REFERENCES ON WOODFUEL CONSUMPTION

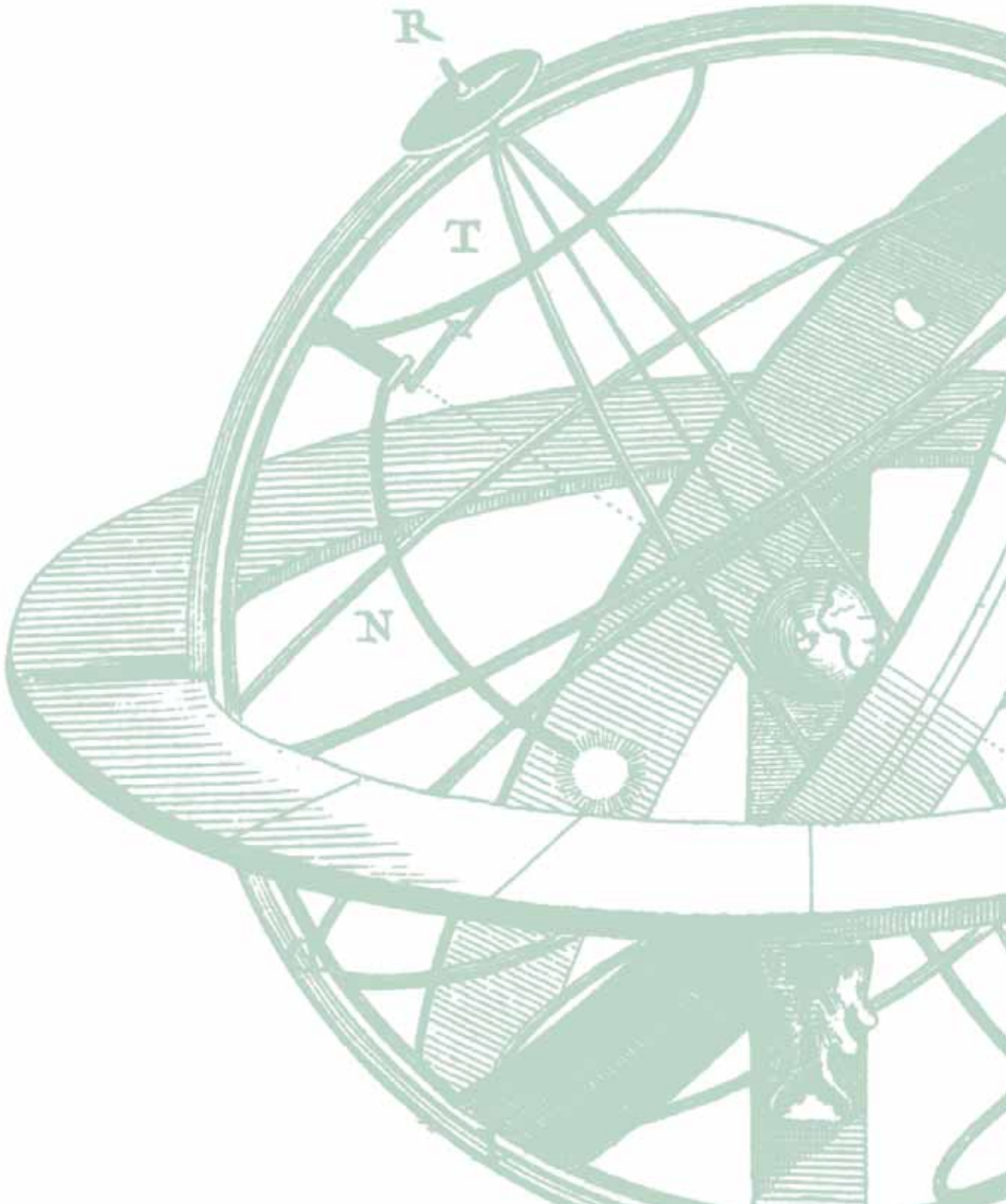


TABLE A 4.1

Summary of total and per capita fuelwood and charcoal consumption
 Highlighted values are those used in the analysis and mapping process

	m ³ of fuelwood (Fw) and wood for charcoal (Ch)												Total household (HH) consumption		Total Non-HH consumption		Best 2000 estimate of total national consumption					
	Rural general				Urban				Rural sparse				Rural settlement				Fw	Ch	Fw	Ch	Fw	Ch
	Fw	Ch	Fw	Ch	Fw	Ch	Fw	Ch	Fw	Ch	Fw	Ch	Fw	Ch	Fw	Ch						
Cambodia	HH consumption	0.69	0.00	0.49	0.08	0.73	-0.01	0.59	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Non-HH consumption			0.01	0.07	0.00	0.01	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Total per capita use	0.69	0.00	0.51	0.15	0.73	0.00	0.60	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	Lowlands			0.51	0.15	0.73	0.00	0.60	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Mountain			1.02	0.15	1.46	0.00	1.19	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Yunnan (Prov. China)	HH consumption	0.48	0.00	0.18	0.00	0.56	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Non-HH consumption			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Tot per capita consumption	0.48	0.00	0.18	0.00	0.56	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	lowlands			0.18	0.00	0.56	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
mountain			0.18	0.00	0.56	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lao DPR	HH consumption	0.98	0.01	0.66	0.15	0.99	0.01	0.82	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	Non-HH consumption			0.21	0.00	0.02	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total per capita use	0.98	0.01	0.87	0.15	1.01	0.01	1.12	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
	lowlands			0.87	0.15	0.85	0.01	1.05	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
mountain			1.74	0.15	2.02	0.01	2.23	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Malaysia (Peninsular)	HH consumption	0.19	0.01	0.00	0.01	0.22	0.01	0.09	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Non-HH consumption			0.06	0.00	0.05	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total per capita use	0.19	0.01	0.06	0.01	0.27	0.01	0.32	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	lowlands			0.06	0.01	0.26	0.01	0.32	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
mountain			0.11	0.01	0.53	0.01	0.64	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Myanmar	HH consumption	0.78	0.00	0.54	0.06	0.81	-0.01	0.66	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Non-HH consumption			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total per capita use	0.78	0.00	0.54	0.06	0.81	-0.01	0.66	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	lowlands			0.51	0.06	0.75	-0.01	0.60	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
mountain			1.08	0.06	1.63	-0.01	1.32	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	
Thailand	HH consumption	0.18	0.31	0.08	0.14	0.20	0.35	0.13	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	Non-HH consumption			0.17	0.08	0.02	0.01	0.08	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Total per capita use	0.18	0.31	0.25	0.22	0.22	0.36	0.21	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
	lowlands			0.25	0.22	0.22	0.36	0.21	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
mountain			0.50	0.22	0.44	0.36	0.42	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	
Viet Nam	HH consumption	0.44	0.01	0.15	0.09	0.62	-0.04	0.30	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Non-HH consumption			0.17	0.00	0.05	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total per capita use	0.44	0.01	0.32	0.09	0.67	-0.04	0.36	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	lowlands			0.32	0.09	0.64	-0.04	0.36	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
mountain			0.64	0.09	1.35	-0.04	0.72	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	

Note: Proportional Distribution of non-household consumption is: Urban areas 0.5; Rural settlements 0.3; Rural sparse 0.2.

TABLE A.4.2

Estimates of national consumption of fuelwood and charcoal according to various sources

The highlighted values were selected as current best reference and used for the calculation of per-capita consumption in the Demand Module. Highlighted values are those used in the analysis and mapping process. Production in '000 m³

		1995	1996	1997	1998	1999	2000
Cambodia							
"Best" current references							
Fw	Country report, which has a slightly lower value than FAOSTAT (based on the regional GFPOS model). WETT 99 figures appear less reliable as they were based on earlier FAOSTAT values.						8 651
Ch	Country report, which has a much higher value than FAOSTAT (based on the global GFPOS model). WETT 99 figures appear less reliable as they are far lower and based on earlier FAOSTAT values.						
	Source details						
Fw	Country Report GCP/RAS/173/EC Cambodia report by Sok Bung Heng - Final Draft Report of the "Desk Study on national woodfuels and wood energy information analysis –Cambodia"						
	FAO estimate	10 767	10 570	10 575	10 327	10 119	9 931
	GFPOS 1970-2030	10 814	10 647	10 586	10 337	10 130	9 931
	WETT99 Best estimate	6 518	6 680	6 838	6 968		
Ch	Country Report GCP/RAS/173/EC Cambodia report by Sok Bung Heng - Final Draft Report of the "Desk Study on national woodfuels and wood energy information analysis –Cambodia"						546.8
	FAO estimate	173	176	182	184	196	188
	GFPOS 1970-2030	173	176	182	184	186	188
	WETT99 Best estimate	13	13	13	13	0	0
Yunnan (Prov. China)							
"Best" current references							
Fw	Tuukka Castrén and Wang Song Jiang, 1999. Timber trade and wood flow–study, Yunnan, China.						
Ch							
	Source details						
Fw	Country report Nguyen Chi Trung, Forest Science Institute of Viet Nam, Hanoi.	1995	1996	1997	1998	1999	2000
Ch	Country report Nguyen Chi Trung, Forest Science Institute of Viet Nam, Hanoi.						16790
							0
Lao PDR							
"Best" current references							
Fw	Country report						
Ch	Country report						
	Source details						
Fw	Country Report GCP/RAS/173/EC Lao PDR report by Mr Oukham Phiathep, Planning Dept., Ministry of Agriculture and Forestry. Main ref: 1997 STENO (sec.source 149) a	4534	4701	4836	4966	5108	5250
	FAO estimate	5641	5672	5704	5718	5744	5770
	GFPOS 1970–2030	5641	5672	5704	5718	5744	5770
	UN Energy Statistics 1995	4404					
	WETT99 Best estimate	357	366	374	390		
Ch	Country Report GCP/RAS/173/EC Lao PDR report by Mr Oukham Phiathep, Planning Department, Ministry of Agriculture and Forestry. Main ref: 1997 STENO and other consumption studies (i.e. UNDP/FAO Luang Prabang Watershed Management Proj.). Projections based on population growth.	176	182	187	192	197	202
	FAO estimate	89	92	94	96	99	102
	GFPOS 1970-2030	89	92	94	96	99	102
	WETT99 Best estimate	830	855	885	879		

see next page →

TABLE A4.2 (cont.)

Malaysia		1995	1996	1997	1998	1999	2000
"Best" current references							
Fw	Regional GFPOS model						
Ch	The global GFPOS model correspond to charcoal production statistics from government sources provided in Heruela's (FAO, 2003c) review and seems to well represent the marginal role that wood energy plays in Malaysia today.						
	Main source	1995	1996	1997	1998	1999	2000
	Source details						
Fw	FAOSTAT (2003)	3 299	3 127	3 126	3 100	3 039	3 185
	GFPOS 1970-2030	3 450	3 378	3 312	3 263	3 224	3 187
	IEA (2002)	4 378	4 474	4 474	4 483	4 590	4 705
	RWEDP	7 696					
	UN Energy Statistics 1995	9 586					
	WETT99 Best estimate	7 110	7 267	7 423	7 562		
Ch	FAOSTAT (2003)	143	145	146	150	154	
	GFPOS 1970-2030	143	145	146	150	154	159
	IEA (2002)	2 424	2 479	2 479	2 485	2 485	2 485
	Other National	1 120	2 480				
	RWEDP	1 120					
	WETT99 Best estimate	2 588	2 566	2 685	2 740		
Myanmar							
"Best" current references							
Fw	The official Figures of FAOSTAT, which correspond well to the data submitted by Ministry of Energy to IEA						
Ch	In the middle of this extremely wide range of estimates, the values of the GFPOS national model appear more realistic. The model estimates show a reasonable match with the values submitted by the Ministry of Energy to IEA.						
	Main source	1995	1996	1997	1998	1999	2000
	Source details						
Fw	FAOSTAT (2003)	17 959	18 260				
	FAOSTAT (2003)			31 448	32 083	34 071	34 332
	GFPOS 1970-2030	18 769	18 645	18 549	18 211	18 035	17 863
	IEA (2002)						
	IEA nonOECD_99	34 102	33 557	34 178	34 808	34 695	35 063
	Other National	30 050		32 779			
	Other National	31 170	30 673	31 165			
	UN Energy Statistics 1995	30 052					
	WETT99 Best estimate	19 966					
	FAOSTAT (1998) years 1981-1998	19 244	19 594	19 954	18 989		
Ch	FAOSTAT (2003)	276	195			70	58
	GFPOS 1970-2030	785	802	820	827	839	852
	IEA (2002)						
	IEA non-OECD_99	1 261	1 279	1 291	1 297	739	667
	Other National	4 408	1 969				
	UN Energy Statistics 1995	1 299	1 305	522			
	WETT99 Best estimate	1 876	195	210			

see next page →

TABLE A.4.2 (cont.)

Thailand		1995	1996	1997	1998	1999	2000
"Best" current references							
Fw	Country Report						
Ch	Country Report						
Main source		Source details					
Fw	Country Report	GCP/RAS/173/EC Thailand report by Sriluck Tatayanon, RFD.					
		Surveys by Dept. Energy Development & Promotion (Energy in HH of rural area, 1997; Thailand energy situation, 1997 and 2000).					
	FAOSTAT (2003)	12 324	12 018	13 391	13 341	13 722	13 634
	GFPOS 1970-2030	13 927	13 651	13 555	13 448	13 241	13 263
	IEA (2002)	13 851	13 586	13 515	13 429	13 343	13 262
		HH Fw: Regional; non-HH Fw model: continental Thailand Energy Situation, Ministry of Science, Technology and Energy, National Energy Administration.					
	IEA nonOECD_99	12 210	11 908	13 268	13 218	13 595	13 508
	Other National	15 981	16 354				
	Other National	15 981					
	RWEDP	12 324	12 018	13 391	13 341		
	UN Energy Statistics 1995	15 843	16 358	16 450			
	WETT99 Best estimate	70 833					
Ch	Country Report	32 289	32 544	32 797	33 430		
		GCP/RAS/173/EC Thailand report by Sriluck Tatayanon, RFD.					
		Surveys by Dept. Energy Development & Promotion (Energy in HH of rural area, 1997; Thailand energy situation, 1997 and 2000).					
	FAOSTAT (2003)	20 695	18 924	18 726	18 570	18 273	18 759
	GFPOS 1970-2030	6 875	6 954	7 034	7 120		
	IEA (2002)	6 875	6 954	7 034	7 120	7 204	7 290
		Charcoal model: National Thailand Energy Situation, Ministry of Science, Technology and Energy, National Energy Administration.					
	IEA nonOECD_99	22 291	20 382	20 176	19 982	19 667	20 182
	Other National	38 136	40 575				
	Other National	38 136					
	RWEDP	37 806	40 583	37 436			
	UN Energy Statistics 1995	20 695	18 924	18 726	18 570		
	WETT99 Best estimate	37 806	40 583	37 436			
		38 160					
		3 990	4 047	4 036	4 115		

see next page 

TABLE A4.2 (cont.)

Viet Nam		1995	1996	1997	1998	1999	2000
"Best" current references							
Fw	Country report by Nguyen Chi Trung, Forest Science Institute of Viet Nam, who quotes the Institute of Energy and presents also urban/rural breakdown. 2000 value extrapolated from 1995-1999 series through linear equation.						
Ch	Main source	1995	1996	1997	1998	1999	2000
Fw	Country report Nguyen Chi Trung, Forest Science Institute of Viet Nam, Hanoi.	32 519	32 792	33 340	33 614	34 161	35 993
	FAOSTAT (2003)	26 025	26 030	26 093	26 033	26 004	26 029
	GFPOS 1970-2030	26 129	26 103	26 107	26 049	26 038	26 029
	IEA (2002)						
	Household Fuelwood model: Regional; non-HH Fw model: continental Secretariat estimates based on 1992 data from Viet Nam Rural and Household Energy Issues and Options: Report No. 161/94, The World Bank, ESMAP, Washington, D.C., 1994.	40 880	42 806	43 671	44 629	43 558	44 124
	Reference not available	38 554	40 872				
	IEA non-OECD_99						
	Other National						
	Other National						
	ASEAN Energy Review						
	Viet Nam - Review of Policies and Legislation Affecting Wood Energy Production, Trade and Use & Institutional Aspects of Wood Energy Plans, Policies and Strategies.	39 448					
	Reference not available	42 879					
	RWEDP	29 748					
	UN Energy Statistics 1995						
	Reference not available						
	FAOSTAT (1998) years 1981-1997	30 166	30 734	31 292	31 707		
Ch	Country report Nguyen Chi Trung, Forest Science Institute of Viet Nam, Hanoi.	1 931	1 948	1 980	1 996	2 029	2 050
	FAOSTAT (2003)	664	661	660	658	657	622
	GFPOS 1970-2030	664	661	660	658	657	656
	IEA (2002)						
	Charcoal model: Global Secretariat estimates based on 1992 data from Viet Nam Rural and Household Energy Issues and Options: Report No. 161/94, The World Bank, ESMAP, Washington, D.C., 1994.	3 345	3 503	3 576	3 655	3 570	3 618
	Reference not available	3 164	3 345				
	IEA nonOECD_99	17	49	107	107		
	WETT99 Best estimate						
	FAOSTAT (1998) years 1990-1998						

Notes:

1. Data extracted from the interactive Wood Energy Statistics database - i-WESTAT (FAO, 2005a).

2. Primary sources were:

ESMAP Energy Sector Management Assistance Programme (joint World Bank-UNDP Programme).

FAOSTAT (2003) Consumption estimates based on 2003 edition of FAOSTAT data.

GFPOS Global Forest Products Outlook Study carried out by the Forestry Policy and Planning Division of FAO Forestry Department.

IEA International Energy Agency.

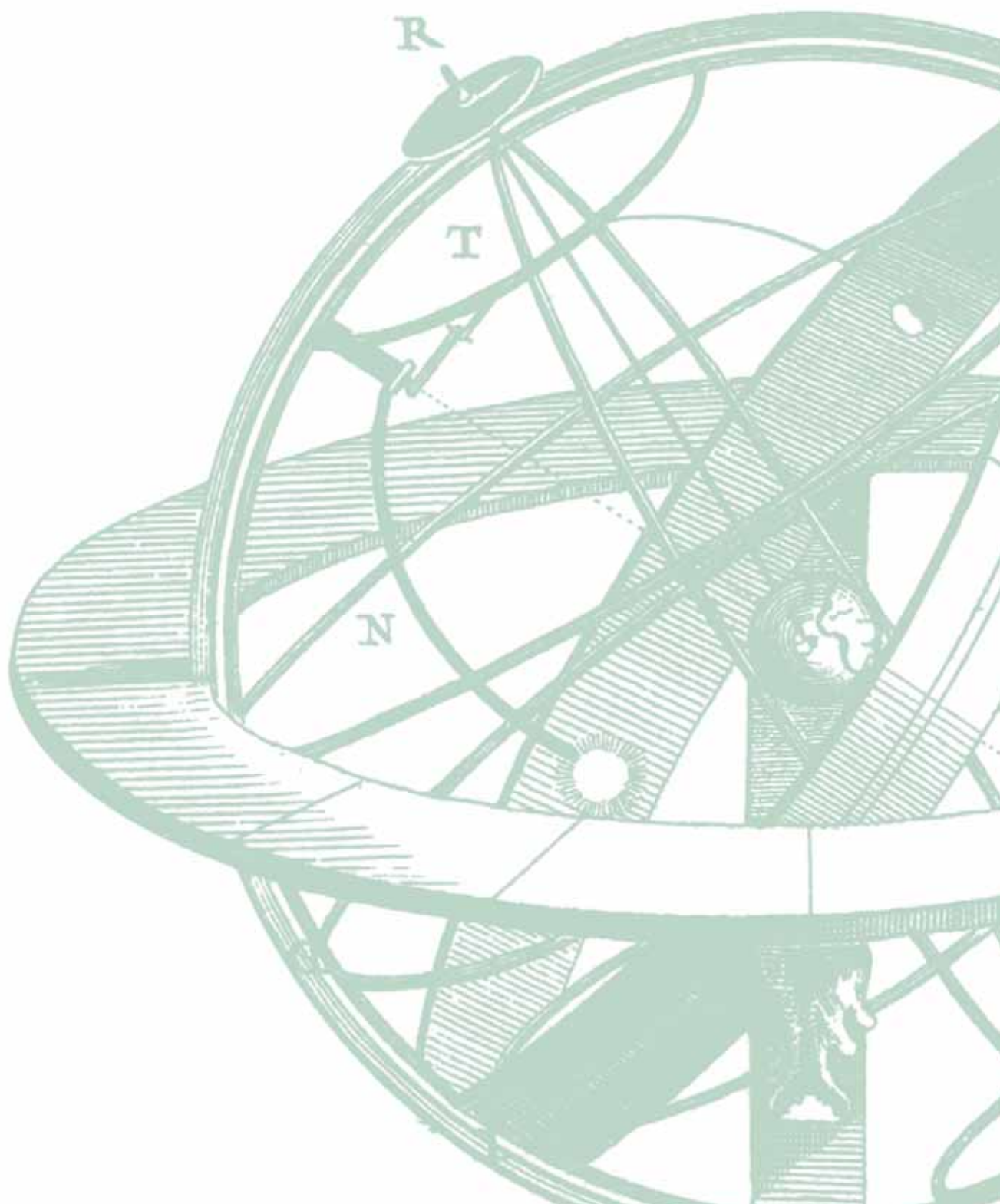
IEPE Institut d'économie et de politique de l'énergie (Grenoble, France).

WETT99 Best estimates Wood Energy Today for Tomorrow, 1999. An activity of the FAO Wood Energy Programme that analysed wood energy information worldwide. Indicates values defined in that study as "best estimates".

ANNEX

5

NUTRITIONAL STATUS INDICATORS



WORLD HEALTH ORGANIZATION CLASSIFICATION

Definition and interpretation of children's nutritional status indicators

For both age groups (children 0–5 and 5–10 years old) the same anthropometric indicators are used and compared across populations in relation to the United States National Center for Health Statistics set of reference values (NCHS/CDC/WHO). The nutritional status of children 0–5 and 5–10 is commonly assessed using the following three indices: weight-for-age; height-for-age; and weight-for-height. The prevalence of anthropometric deficits is usually expressed as the percentage of children below a specific cut-off point, such as minus 2 standard deviations (or z-scores) from the median value of the international reference data.

- **Underweight** – Low weight-for-age is commonly referred to as underweight. Weight-for-age reflects body mass relative to chronological age and it is primarily a composite index of both weight-for-height and height-for-age. Weight-for-age fails to distinguish tall, thin children from those who are short with adequate weight. This arises because this index ignores the child's height, and, at a given age, taller children tend to be heavier than their shorter counterparts. According to the WHO classification of malnutrition, if the prevalence of underweight in children 0–5 years old is <10 percent, it is considered to be low; between 10 and 19 percent it is medium; between 20 and 29 percent it is high; and ≥ 30 percent it is considered to be very high.
- **Stunting** – Height-for-age reflects achieved linear growth, and deficits indicate long-term, cumulative inadequacies of health and nutrition. Stunting is a commonly used term that reflects a process of failure to reach linear growth potential as a result of suboptimal health or nutritional conditions, or both. Stunting is frequently found to be associated with poor overall socio-economic status, or repeated exposure to adverse conditions such as illness and inappropriate feeding practices. A child is considered to be stunted if their height-for-age is below minus 2 z-scores (standard deviations) from the median of the reference curve of height-for-age. According to the WHO classification of malnutrition, if the prevalence of stunting in children 0–5 years old is <20 percent it is considered to be low; between 20 and 29 percent it is medium; between 30 and 39 percent it is high; and ≥ 40 percent it is considered to be very high.
- **Wasting** – Low weight-for-height indicates a deficit of tissue and fat mass compared with the amount expected in a standard child of the same height or length. Low weight-for-height – also referred to as wasting – reflects a recent and severe process that has led to significant weight loss, usually as a consequence of food shortage or infectious diseases. One advantage of this index is that it can be obtained without knowing age, which makes it useful in populations that do not record dates of birth or for whom this information is unavailable or unreliable. Very often, there are seasonal episodes of wasting related to variations either in food supply or in diseases prevalence. One of the main characteristics of wasting is that its prevalence can increase very rapidly, and under favourable conditions can rapidly be mitigated. According to the WHO classification of malnutrition, if the prevalence of wasting in children 0–5 years old is <5 percent it is considered to be acceptable; between 5 and 9 percent it is poor; between 10 and 14 percent it is serious.

FIVIMS THAILAND

Definition of “Vulnerable area” by provinces:

- **The Most Vulnerable Group (Provinces 1–5)** – Most vulnerable, due to the concomitance of various food insecurity and nutrition outcomes and vulnerability factors. These groups are also characterized by low or very low per capita income. Provinces 1 to 5 are included in this subgroup.
- **Vulnerable Group (Provinces 6–10)** – Vulnerable, but not to the same extent as that of the previous subgroup. Provinces 6 to 10 are identified in this subgroup. In general, in these groups, the per capita income is higher than among the previous subgroup.
- **Less Vulnerable Group (Provinces 11–13)** – Less vulnerable, but in which some particular food insecurity and nutrition outcomes or some vulnerability factors can be detected. All other groups are included in this category. Not surprisingly, the per capita income of these groups is significantly higher than the national average.

ANNEX

6

COUNTRY POPULATIONS IN 2000 CHARACTERIZED BY A COMBINATION OF WOOD ENERGY AND POVERTY-RELATED PARAMETERS

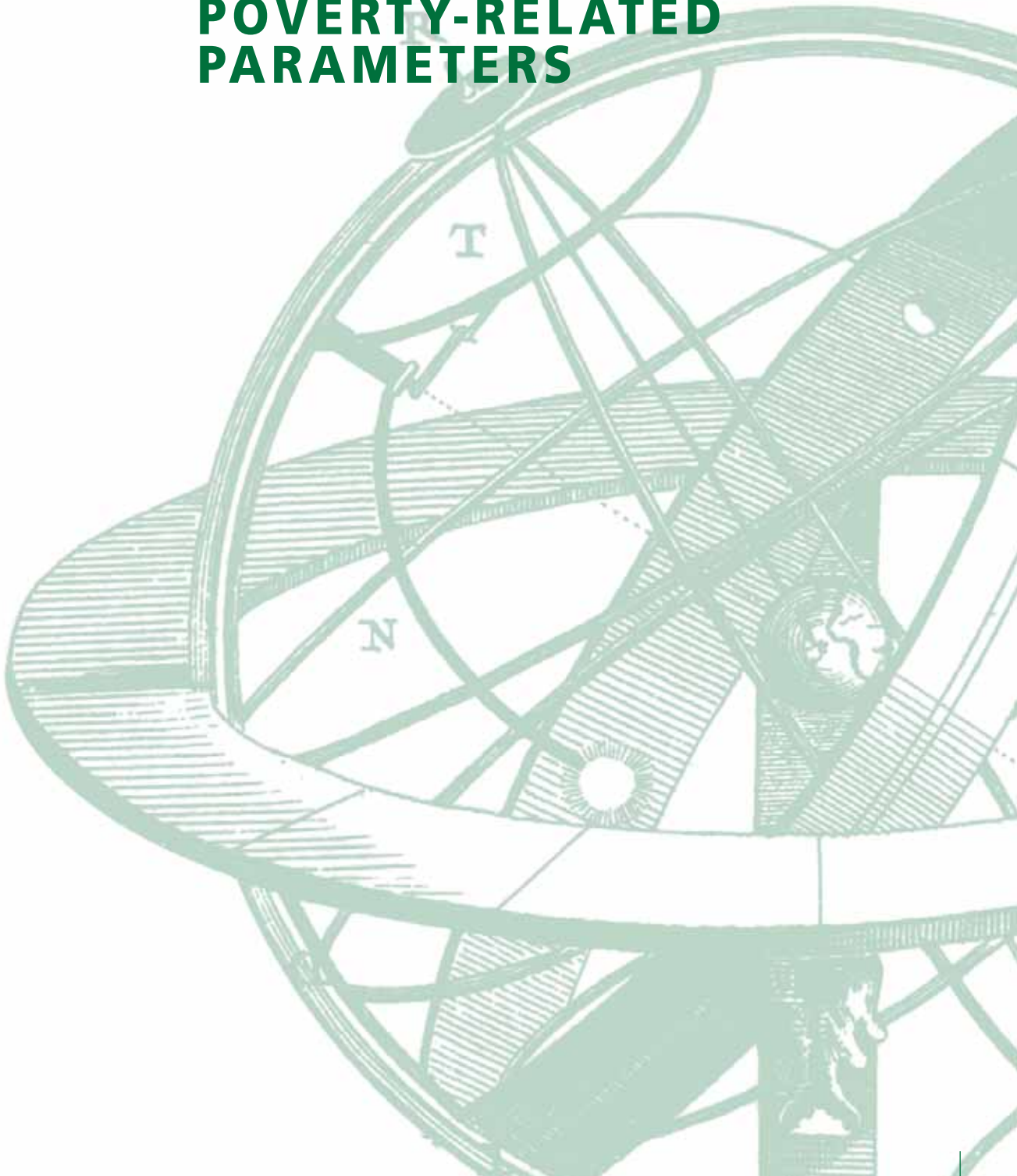


TABLE A6.1

Cambodia – population distribution by woodfuel balance categories and malnutrition levels (percent)

Woodfuel supply/demand balance	Malnutrition (or vulnerability)						Total	
	low	mid-low	mid-high	high	very high	critical		
	1	2	3	4	5	6		
critical deficit	1	8.6					8.6	"very serious conditions" total 25.3
very high deficit	2							
high deficit	3				16.8	8.4	25.3	
medium deficit	4				14.5	4.2	18.7	"serious" total 18.7
light deficit	5							
balanced	6	5.3					5.3	"serious"+ "very serious" = 44.0
light surplus	7				4.3		4.3	
	8					3.7	3.7	
	9			6.8	5.7	6.0	18.5	
	10			0.3	8.2	6.1	14.5	
very high surplus	11					1.1	1.1	
		14.0		7.0	53.2	25.8	100	

TABLE A6.2

Lao PDR – population distribution by woodfuel balance categories and malnutrition levels (percent)

Woodfuel supply/demand balance	Malnutrition (or vulnerability)						Total	
	low	mid-low	mid-high	high	very high	critical		
	1	2	3	4	5	6		
critical deficit	1							"very serious conditions" total 6.8
very high deficit	2				4.7		4.7	
high deficit	3				2.1		2.1	
medium deficit	4				3.9	1.4	5.3	"serious" total 5.3
light deficit	5							
balanced	6					2.5	2.5	"serious"+ "very serious" = 12.1
light surplus	7							
	8					5.5	5.5	
	9		1.0		4.0	5.0	10.0	
	10		3.7	9.9	8.3	35.2	57.1	
very high surplus	11		1.7	0.4	3.2	7.5	12.9	
			6.3	10.4	26.3	57.0	100	

TABLE A6.3

Malaysia – population distribution by woodfuel balance categories and malnutrition levels (percent)

Woodfuel supply/demand balance	Malnutrition (or vulnerability)						Total	
	low	mid-low	mid-high	high	very high	critical		
	1	2	3	4	5	6		
critical deficit	1							"very serious conditions" total 0
very high deficit	2							
high deficit	3		6.8				6.8	
medium deficit	4							"serious" total 6.8
light deficit	5							
balanced	6							"serious"+ "very serious" = 6.8
light surplus	7							
	8							
	9							
	10		6.4	0.3			6.7	
very high surplus	11		75.8		10.7		86.5	
			89.0	0.3	10.7		100	

TABLE A6.4

Myanmar – population distribution by woodfuel balance categories and malnutrition levels (percent)

Woodfuel supply/demand balance	Malnutrition (or vulnerability)						Total	
	low	mid-low	mid-high	high	very high	critical		
	1	2	3	4	5	6		
critical deficit	1	8.1					8.1	"very serious conditions" total 7.9
very high deficit	2	1.6	1.1	0.9	0.5		4.1	
high deficit	3	6.1	9.3	6.4			21.9	
medium deficit	4	3.6	6.4	3.1	0.3		13.4	"serious" total 20.2
light deficit	5							
balanced	6	0.0	2.2	0.9			3.1	"serious" + "very serious" = 28.0
light surplus	7		0.6	0.7			1.3	
	8	1.0	1.7	1.7			4.3	
	9	2.4	2.4	1.7	3.3		9.8	
	10	2.2	13.3	7.8	4.5		27.8	
very high surplus	11		2.3	0.8	3.2		6.3	
		25.0	39.1	24.0	11.9		100	

TABLE A6.5

Thailand – population distribution by woodfuel balance categories and malnutrition levels (percent)

Woodfuel supply/demand balance	Malnutrition (or vulnerability)						Total	
	low	mid-low	mid-high	high	very high	critical		
	1	2	3	4	5	6		
critical deficit	1	10.3					10.3	"very serious conditions" total 0
very high deficit	2	3.3					3.3	
high deficit	3	2.2	3.0				5.2	"serious" total 9.1
medium deficit	4			6.0			6.0	
light deficit	5	1.4	0.3	1.0	2.2		4.9	
balanced	6	2.2	0.5	1.8	6.8	0.9	12.2	"serious" + "very serious" = 9.1
light surplus	7			2.6			2.6	
	8	0.4	6.0	1.1	7.6	0.7	15.8	
	9	0.8	1.0	8.0	3.7	2.9	16.5	
	10		8.6	8.9	1.0		18.5	
very high surplus	11		3.1	1.7			4.8	
		20.5	22.6	22.5	29.9	4.5	100	

TABLE A6.6

Viet Nam – population distribution by woodfuel balance categories and malnutrition levels (percent)

Woodfuel supply/demand balance	Malnutrition (or vulnerability)						Total		
	low	mid-low	mid-high	high	very high	critical			
	1	2	3	4	5	6			
critical deficit	1	3.3					3.3	"very serious conditions" total 22.8	
very high deficit	2	6.8	2.4	2.2	12.6		24.0		
high deficit	3			6.6	10.2		16.7		
medium deficit	4		2.7	4.7	1.3	3.7	12.4	"serious" total 23.0	
light deficit	5					4.5	4.5		
balanced	6		0.9		0.0		0.9	"serious" + "very serious" = 45.8	
light surplus	7		2.1				2.1		
	8	0.0			1.2	1.1	2.3		
	9				2.6	13.5	0.9		17.0
	10		1.1		8.9	3.5	3.4		16.9
very high surplus	11								
		10.0	9.2	13.5	36.8	26.3	4.3	100	

TABLE A6.7

Yunnan (Prov. China) – population distribution by woodfuel balance categories and malnutrition levels (percent)

Woodfuel supply/demand balance		Malnutrition (or vulnerability)						Total	
		low 1	mid-low 2	mid-high 3	high 4	very high 5	critical 6		
critical deficit	1								"very serious conditions" total 0
very high deficit	2								
high deficit	3								
medium deficit	4						1.8	1.8	"serious" total 9.5
light deficit	5						7.7	7.7	
balanced	6						2.4	2.4	"serious"+ "very serious" = 9.5
light surplus	7						3.6	3.6	
	8						12.8	12.8	
	9						28.6	28.6	
	10						42.1	42.1	
very high surplus	11						1.1	1.1	
							100.0	100	

ANNEX

7

LAND COVER CHANGE REFERENCES



FRA 2005 NATIONAL FOREST AREA STATISTICS

TABLE A7.1

National forest area change statistics for the period 2000–2005, published by the FAO Forest Resources Assessment 2005 (FRA 2005)

Country	Forest						
	Area			Annual change rate			
	1990	2000	2005	1990-2000		2000-2005	
'000 ha	'000 ha	'000 ha	'000 ha/yr	percent	'000 ha/yr	percent	
Cambodia	12 946	11 541	10 447	-141	-1.09	-218.8	-1.90
Lao PDR	17 314	16 532	16 142	-78	-0.45	-78	-0.47
Malaysia	22 376	21 591	20 890	-79	-0.35	-140.2	-0.65
Myanmar	39 219	34 554	32 222	-467	-1.19	-466.4	-1.35
Thailand	15 965	14 814	14 520	-115	-0.72	-58.8	-0.40
Viet Nam	9 363	11 725	12 931	236	2.52	241.2	2.06
Total	117 183	110 757	107 152	-643	-0.55	-721	-0.65
China	157 141	177 001	197 290	1 986	1.20	4 058	2.20

Source: FAO FRA Web site.

TABLE A7.2

Change rates applied for the estimation of forest resources in 2015 (see Table A7.2A for Yunnan data, and Section A7.3 for comments on the Viet Nam situation)

Country	Change 2000–2005	Annual rate 2000–2005	Annual percent 2000–2005	Compound rate 2000–2005	RS rate 1990–2000 ⁽¹⁾	Forest area 2015	Change 2000–2015	Percent change 2000–2015
Cambodia	-1,094	-218.8	-1.90	0.9802788		8 560	-2 981	-25.8
Lao PDR	-390	-78	-0.47	0.9952367		15 389	-1 143	-6.9
Malaysia	-701	-140.2	-0.65	0.9934205		19 556	-2 035	-9.4
Myanmar	-2 332	-466.4	-1.35	0.9861224		28 020	-6 534	-18.9
Thailand	-294	-58.8	-0.40	0.9959989		13 949	-865	-5.8
Viet Nam	1,206	241.2	2.06	1.0197738		15 728	4 003	34.1
Viet Nam	Tentative estimate based on 4 sampling units 1990–2000				0.993442	10 623	-1 102	-9.4
Total Se Asia	-3 605	-721	-0.65	0.9934038		100 290	-10 467	-9.5
China	20 289	4057.8	2.29	1.0219411		245 112	68 111	38.5

Note: ⁽¹⁾ Compound rate for the period 1990–2000 estimated using the remote sensing survey results (see page 104).

TABLE A7.2A

Change rates applied for the estimation of forest resources in 2015 – data for Yunnan Province, China

Country	Change 1990–2005	Annual rate 1990–2005	Annual percent 1990–2005	Compound rate 1990–2005	Forest area	Change 2000–2015	Percent change 2000–2015
China	40 149	2676.6	1.70	1.0152844	229 605	52 604	29.7

DATA BASED ON REMOTE SENSING

A Remote Sensing Survey was conducted in the framework of FRA 1990 and FRA 2000, and the results, for continental SE Asia for 1990–2000 are summarized in Table A7.3. The result consists of a transition matrix which can be represented in form of a biomass flux diagram.

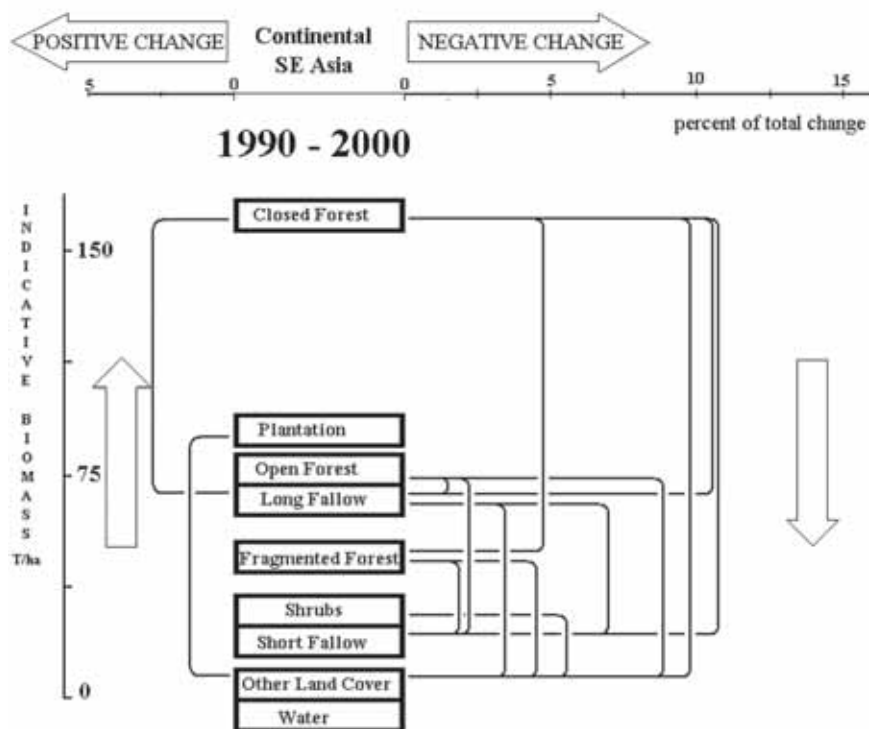
TABLE A7.3

Estimated 1990–2000 transition matrix expanded to the entire continental Southeast Asia subregional area. Area in '000 ha

Classes in 1990	Classes in 2000									Σ 1990
	Closed forest	Open forest	Long fallow	Fragmented forest	Shrub	Short fallow	Other land cover	Water	Manmade woody veg.	
Closed forest	57 572	142	1027	475	41	1061	952	107	22	61 399
Open forest	80	10 994	150	37	112	215	863	7	0	12 458
Long fallow	272	0	17 193	18	9	677	346	34	0	18 549
Fragmented forest	49	28	88	5 766	1	173	448	0	18	6 571
Shrub	39	17	16	10	4 906	94	552	26	14	5 674
Short fallow	43	1	108	28	11	5 895	550	15	0	6 651
Other land cover	114	84	61	40	114	94	66 435	61	145	67 148
Water	15			5	13		53	868		954
Manmade woody veg.	4						31		6 762	6 797
Σ 2000	58 188	11 266	18 643	6 379	5 207	8209	70 230	1 118	6 961	186 201

FIGURE A7.1

Continental Southeast Asia biomass flux diagram



CONSIDERATIONS ON VIET NAM FOREST CHANGE RATES

FRA 2005 estimates give a very consistent increment for natural forest area of 112 000 ha/year for 2000–2005 (128 000 ha for 1990–2000) in addition to the plantation rates of 108 000 ha/yr for 1990–2000 and 129 000 ha/yr for 2000–2005.

For the sake of reference is represented by the four sampling units located in Viet Nam (covering some 7.8 million ha, or almost one-quarter of the country) that report deforestation in all locations and an overall forest change rate of -0.66 percent for the F2 definition (that best matches the FRA forest definition), that lessens to -0.64 percent if increasing plantations are considered. This rate is about two-thirds of the subregional mean without Viet Nam (-0.97 percent/yr).

The FAO projections of agricultural areas in 2015 indicate a significant increase in cropland in the whole subregion, and particularly in Viet Nam, Cambodia and Lao PDR, which strengthens the hypothesis of a decrease in the Vietnamese forest area.

In the light of sample results and projected cropland, FRA 2005 statistics appear rather unrealistic and this might reflect the data collection method, which was probably based on independent periodic assessments and on progressively revised definitions, rather than on a direct and consistent estimation of forest cover dynamics.

Therefore, as one possible hypothesis for scenario development, the rate of -0.64 percent/yr was applied to project the 2015 forest area.

TABLE A7.4

Viet Nam sampling units

	Year	Forest definition F2 ⁽¹⁾	
		Absolute forest cover '000 ha	Relative forest cover as percent of land area
4501 Central Viet Nam	1980	1013.4	72.0
	1990	1007.2	71.5
	2000	983.5	69.9
4502 South Viet Nam	1980	1589.4	72.5
	1990	1489.3	68.0
	2000	1412.6	64.5
4503 South Viet Nam	1980	1654.2	73.7
	1990	1394.6	62.1
	2000	1216.0	54.2
4509 North Viet Nam	1980	616.3	25.1
	1990	566.4	23.0
	2000	551.6	22.4

Note: ⁽¹⁾ Results relative to F2 definition of forest, which was the best match for FRA definition of forest (FAO, 1996a).

Source: TEMS database. http://www.fao.org/gtos/tems/mod_fra.jsp?FRA_PAGE=body/fra_tree.jsp&EXPAND_SUBREGION=45.

CONSIDERATIONS ON CHINA FOREST CHANGE RATES

The FRA 2005 China data shows a very high forest area increment in both natural forest (+2.5 million ha/yr) and plantations (+1.5 million ha/yr) in the 2000–2005 period. If projected to 2015, this rate will imply a very substantial increase in forest area, namely 38.5 percent.

An independent reference is represented by the four sampling units located in Viet Nam (covering some 7.8 million ha, or almost one-quarter of the country) that report deforestation in all locations and an overall forest change rate of -0.66 percent for the F2 definition (that best matches the FRA forest definition), that lessens to -0.64 percent if increasing plantations are considered. For the sake of caution, the change rate applied was that of the wider period 1990–2005, which, extrapolated to 2015, implied an increase in forest area, with respect to 2000, of 29.7 percent.

This rate was in part supported by the FAO projections of agricultural areas in 2015, which indicate a significant decrease in cropland.

BUFFERS WITHIN FOREST AREAS USED TO ALLOCATE THE PREDICTED 2000–2015 CHANGE

The predicted change in woody biomass stocking due to the predicted change in forest area was spatially distributed according to (i) distance from forest edge and (ii) distance from high consumption areas, based on the premise that closer to forest edges and closer to high demand sites the probabilities of change are higher. Table A7.5 lists the buffer thresholds used and the change rates finally applied in each buffer combination for each country.

TABLE A7.5

General weighting values applied for forest edge proximity and for distance from high demand sites

Forest edge buffers		High consumption sites buffers		
Distance from forest edge "fordistance"	Fraction of overall change rate	Consumption buffers: distance from high consumption sites	Weight applied to change rate	Exceptions
1: 1 pixel (0.9 km)	0.1	1: < 75 km	1.25	Malaysia (1.0) and Viet Nam (1.15)
2: 2–5 pixels	0.4	2: 75–150 km	1	not Viet Nam (0.85)
3: 6–10 pixels	0.8	3: >150 km	Remaining change	
4: >10 pixels	1.6			

TABLE A7.6

Development of change rates adjusted for forest edge proximity and for distance from high demand sites

	Estimated forest change 2000–2015 ('000 ha)				areas of "exploitable" forest by combined buffers ('000 ha)				Change rate of combined buffers		
	Consumption buffers				Consumption buffers				Consumption buffers		
Cambodia											
Fordistance	total	1	2	3	total	1	2	3	1	2	3
1	-1 050	-229	-346	-476	2 130	371	701	1 058	-0.62	-0.49	-0.45
2	-676	-53	-255	-368	2 396	151	903	1 341	-0.35	-0.28	-0.27
3	-91	-2	-47	-42	577	9	301	267	-0.20	-0.16	-0.16
4	-10	0	-4	-5	285	3	128	154	-0.04	-0.03	-0.03
Total	-1 827				5 387						
Lao PDR											
Fordistance		1	2	3	total	1	2	3	1	2	3
1	-265	-10	-38	-217	2 255	67	324	1 864	-0.15	-0.12	-0.12
2	-115	-2	-10	-103	1 885	32	164	1 689	-0.08	-0.06	-0.06
3	-9		-1	-8	280		23	257		-0.03	-0.03
4					6			6			-0.01
Total	-389				4 427						
Malaysia											
Fordistance		1	2	3	total	1	2	3	1	2	3
1	-934	-934			4 025	4 025			-0.23		
2	-636	-636			8 042	8 042			-0.08		
3	-136	-136			3 313	3 313			-0.04		
4	-21	-21			2 095	2 095			-0.01		
Total	-1 727				17 474						
Myanmar											
Fordistance		1	2	3	total	1	2	3	1	2	3
1	-2 694	-1 107	-780	-807	8 875	2 917	2 569	3 388	-0.38	-0.30	-0.24
2	-1 758	-631	-454	-674	11 553	3 317	2 980	5 257	-0.19	-0.15	-0.13
3	-159	-51	-30	-78	2 095	536	393	1 166	-0.09	-0.08	-0.07
4	-7	-1	-1	-5	342	56	33	252	-0.03	-0.02	-0.02
Total	-4 619				22 865						

see next page 

TABLE A7.7

Development of change rates adjusted for forest edge proximity and for distance from high demand sites

	Estimated forest change 2000–2015 ('000 ha)				Areas of "exploitable" forest by combined buffers ('000 ha)				Change rate of combined buffers		
	Consumption buffers				Consumption buffers				Consumption buffers		
Thailand											
For distance		1	2	3	total	1	2	3	1	2	3
1	-433	-86	-159	-188	3 771	598	1 388	1 785	-0.14	-0.11	-0.11
2	-207	-29	-76	-102	3 228	362	1 186	1 681	-0.08	-0.06	-0.06
3	-11	-1	-4	-6	264	23	96	145	-0.05	-0.04	-0.04
4	0		0	0	30		1	30	-0.01	-0.01	
Total	-651				7 294						
Viet Nam											
For distance		1	2	3	total	1	2	3	1	2	3
1	-385	-257	-107	-20	2 401	1 396	789	217	-0.18	-0.14	-0.09
2	-216	-151	-64	-2	2 628	1 594	910	124	-0.09	-0.07	-0.01
3	-13	-8	-4	0	295	169	109	17	-0.05	-0.04	-0.02
4	0	0	0	0	23	13	7	3	-0.01	-0.01	-0.01
Total	-614				5 347						

TABLE A7.8

Estimated average fraction of exploitable woody biomass from forest classes (including stem, bark and branches) used for other, non-energy uses

Country	GFPOS industrial roundwood production model ⁽¹⁾ (‘000 m ³ VOB ₁₀ [stem only])			Extrapolated value	Fraction of exploitable VOB ₁₀ produced for other uses from forest classes	Fraction of exploitable woody biomass from forest classes used for other uses	Fraction of exploitable woody biomass from forest classes available for energy uses
	2000	2005	2010				
Cambodia	806	950	1 014	1 078	0.16	0.060	0.940
China	112 575	129 431	151 582	173 733	0.34	0.127	0.873
Lao PDR	984	1 062	1 212	1 362	0.15	0.060	0.940
Malaysia	37 382	37 567	37 910	38 253	0.44	0.281	0.719
Myanmar	3 329	3 715	3 975	4 235	0.11	0.044	0.956
Thailand	8 159	8 729	9 734	10 739	0.93	0.364	0.636
Viet Nam	4 859	5 412	6 106	6 800	0.69	0.279	0.721

Note: ⁽¹⁾ GFPOS industrial roundwood production model from FAO, 1998b.

ANNEX

8

WOODFUEL CONSUMPTION PROJECTIONS



GFPOS MODEL PROJECTIONS

The FAO Global Forest Product Outlook Study (GFPOS) produced fuelwood and charcoal consumption projections up to year 2030 for all countries of the world based on existing survey data and modelling techniques (FAO, 2001a). Country estimates were based on national, regional or global models, depending on the data available.

Key parameters in most models were:

- per capita GDP purchasing power parity in 1997 US\$;
- forest area per capita;
- urban proportion of the population;
- 1997 oil production in barrels per capita per year;
- national land area in thousands of hectares;
- temperature; and
- dummy variables determined for each country.

In order to check the validity of modelling assumptions, the GDP growth rates used in the GFPOS study were compared with current World Bank statistics. World Bank data available for Cambodia, Lao PDR and Viet Nam for the period 1994–2004 confirmed that GDP growth rates for these countries did not differ significantly from that projected in GFPOS. It was concluded that GFPOS model predictions of fuelwood and charcoal consumption were still valid, and therefore their trends for the period 2000–2015 were used to project from the 2000 baseline values forward to 2015, as reported in Tables A8.1 and A8.2.

TABLE A8.1

Estimated total charcoal consumption in 2000 and 2015 and reference values from the GFPOS study used for consumption projections

Country	Fuelwood ('000 m ³)		GFPOS compound rate			Fuelwood model type ⁽²⁾
	Phase 1	Phase 2	GFPOS			
	2000	2015	2000	2015	2000-2015	
Cambodia	8 651	6 581	9 931	7 555	0.981 93	HH: Regional; non-HH: continental
Yunnan (Prov. China)	16 790	12 574	216 721 ⁽¹⁾	162 300 ⁽¹⁾	0.980 91	HH: National; non-HH: continental
Lao DPR	5 250	5 229	5 770	5 747	0.999 73	HH: Regional; non-HH: continental
Malaysia	3 185	2 396	3 187	2 398	0.981 22	HH: Regional; non-HH: continental
Myanmar	34 332	26 830	17 863	13 960	0.983 70	HH: Regional; non-HH: continental
Thailand	13 634	10 308	13 262	10 027	0.981 53	HH: Regional; non-HH: continental
Viet Nam	35 593	32 279	26 029	23 606	0.993 51	HH: Regional; non-HH: continental

Notes: ⁽¹⁾ GFPOS values refer to entire China. ⁽²⁾ HH = household consumption model. non-HH = consumption model for all non-household sectors.

TABLE A8.2

Estimated total charcoal consumption in 2000 and 2015 (as wood used for charcoal production) and reference values from the GFPOS study used for consumption projections

Country	Charcoal ('000 m ³ of wood used for charcoal production)		GFPOS compound rate			Charcoal model type
	Phase 1	Phase 2	GFPOS			
	2000	2015	2000	2015	2000-2015	
Cambodia	547	653	188	225	1.011 89	Global
Yunnan (Prov. China)	0 ⁽¹⁾	0	10 788	10 085	0.995 52	Global
Lao DPR	202	282	102	141	1.022 29	Global
Malaysia	159 ⁽²⁾	177	159	177	1.007 38	Global
Myanmar	852	1 075	852	1 075	1.015 62	National
Thailand	18 759	22 594	7 290	8 780	1.012 48	National
Viet Nam	2 050	2 048	656	656	0.999 94	Global

Notes: ⁽¹⁾ No Charcoal consumption assumed in Yunnan. ⁽²⁾ GFPOS was used as main reference source.

Two scenarios were considered: one “business-as-usual” (BAU) in which per capita consumptions were maintained constant (high-consumption scenario), and another one with decreasing per capita consumption, as projected by the GFPOS model (low-consumption scenario). The results are summarized in Table A8.3.

TABLE A8.3

Summary by country for the total estimated woody biomass consumed in 2000 and the consumption predicted in 2015 according to both the BAU scenario and the GFPOS trend scenario

	Consumption of woody biomass for energy (‘000 t oven-dry biomass)		
	2000 Baseline 2000	2015 BAU 2015	2015 GFPOS trend 2015
Cambodia	5 407	6 969	4 262
Yunnan (China)	9 874	10 487	7 381
Lao DPR	3 097	4 271	3 132
Malaysia	1 996	2 089	1 429
Myanmar	20 012	23 212	16 226
Thailand	18 887	21 027	19 219
Viet Nam	21 834	26 038	19 963

ANNEX

9

2015 SUPPLY/DEMAND SCENARIOS

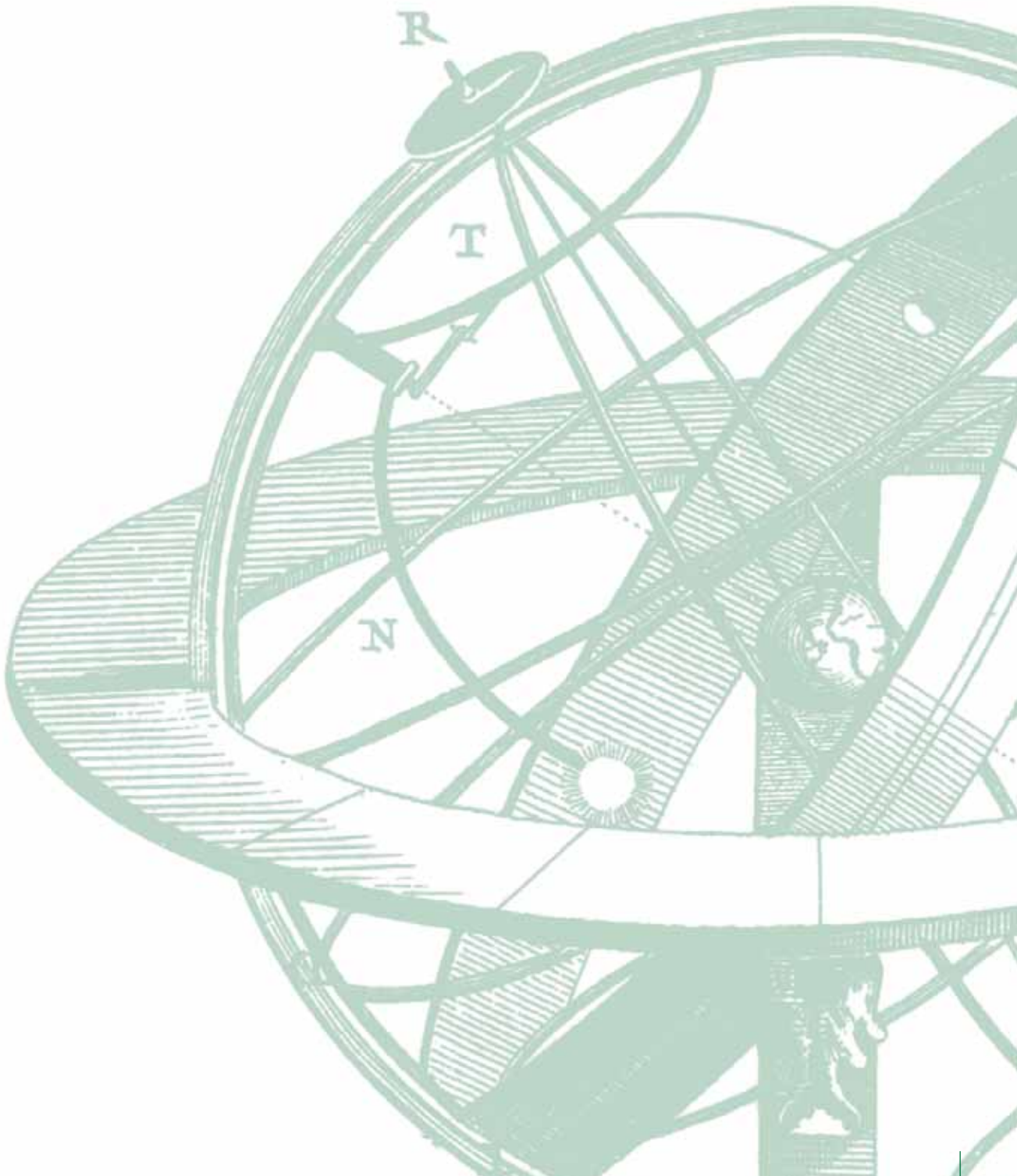


TABLE A9.1

Overall supply/demand balance aggregated at national level ('000 t of woody biomass) for three productivity supply levels within two consumption scenarios

Supply	GFPOS-trend consumption scenario			BAU consumption scenario		
	Mean productivity	Minimum productivity	Maximum productivity	Mean productivity	Minimum productivity	Maximum productivity
Cambodia	11 319	101	26 277	8 612	-2 607	23 570
Yunnan (China)	43 472	6 858	92 290	40 366	3 752	89 184
Lao DPR	31 706	6 623	65 151	30 567	5 484	64 012
Malaysia	107 664	29 117	212 392	107 003	28 457	211 732
Myanmar	78 388	10 266	169 216	71 401	3 280	162 230
Thailand	24 351	-7 020	66 179	22 544	-8 827	64 372
Viet Nam	10 990	-11 296	40 705	4 915	-17 371	34 630

TABLE A9.2

Balance thresholds used in the definition of balance categories. Threshold values are supply <minus> consumption by 30 arc-sec pixel in kg (the threshold values are quintiles of the 2000 balance values)

Threshold	Code	Balance category
< -67 676	1	high deficit
-67 676 – -31 204	2	medium-high deficit
-31 204 – -6 889	3	medium deficit
-6 889 – 5 267	4	balanced
5 267 – 29 582	5	medium surplus
29 582 – 53 897	6	medium-high surplus
> 53 897	7	high surplus

TABLE A9.3A

Areas by woodfuel balance categories expressed as percentage of a country's area under different supply/demand balance conditions in the GFPOS-trend consumption scenario

	High deficit	Medium-high deficit	Medium-low deficit	Balanced	Medium-low surplus	Medium-high surplus	High surplus
Mean productivity							
Cambodia	4.2	7.0	7.2	8.6	9.2	12.8	50.9
Yunnan (China)	0.3	1.3	2.4	2.3	8.4	13.4	71.8
Lao DPR	0.8	0.8	1.4	1.2	3.4	7.0	85.5
Malaysia	0.1	0.1	0.1	1.3	0.6	0.6	97.2
Myanmar	4.3	5.9	5.5	2.4	4.5	6.1	71.3
Thailand	3.8	7.3	11.0	10.1	15.7	14.5	37.6
Viet Nam	13.8	6.9	6.9	4.4	9.9	13.7	44.3
Total area	4.0	4.5	5.4	4.3	7.7	9.6	64.5
Minimum productivity							
Cambodia	12.1	8.9	9.2	13.3	38.5	14.1	3.9
Yunnan (China)	3.5	6.3	12.9	13.0	42.5	18.4	3.4
Lao DPR	2.4	3.0	5.6	6.2	45.2	25.0	12.8
Malaysia	0.6	0.4	0.6	2.1	3.6	9.7	83.1
Myanmar	9.8	7.6	7.0	5.2	29.8	27.4	13.2
Thailand	7.5	13.5	20.6	16.8	29.9	9.3	2.4
Viet Nam	23.1	11.1	12.3	10.7	28.4	12.4	1.9
Total area	8.4	7.8	10.4	9.5	30.2	17.3	16.3
Maximum productivity							
Cambodia	2.8	4.8	5.3	7.4	6.3	5.5	67.9
Yunnan (China)	0.1	0.5	0.9	0.8	2.5	4.0	91.2
Lao DPR	0.5	0.3	0.4	0.4	1.2	1.8	95.3
Malaysia	0.1	0.0	0.1	1.2	0.3	0.3	98.1
Myanmar	2.7	4.3	4.4	2.1	3.1	2.8	80.5
Thailand	2.0	3.2	5.1	6.5	10.9	10.3	62.0
Viet Nam	10.0	4.0	4.2	2.7	5.5	6.4	67.2
Total area	2.6	2.7	3.2	3.0	4.5	4.7	79.4

TABLE A9.3B

Areas by woodfuel balance categories expressed as percentage of a country's area under different supply/demand balance conditions in the BAU consumption scenario

	High deficit	Medium-high deficit	Medium-low deficit	Balanced	Medium-low surplus	Medium-high surplus	High surplus
Mean productivity							
Cambodia	9.5	6.5	5.9	7.9	8.4	12.1	49.6
Yunnan (China)	1.6	2.3	3.1	2.7	8.5	13.2	68.5
Lao DPR	1.4	1.1	1.5	1.2	3.4	7.1	84.2
Malaysia	0.3	0.1	0.1	1.3	0.6	0.7	96.9
Myanmar	7.3	5.7	4.5	2.1	4.2	5.9	70.3
Thailand	4.5	5.6	9.8	10.2	16.4	15.1	38.3
Viet Nam	17.3	6.6	6.6	4.0	9.2	13.1	43.2
Total area	5.9	4.3	4.9	4.2	7.6	9.5	63.6
Minimum productivity							
Cambodia	12.1	8.9	9.2	13.3	38.5	14.1	3.9
Yunnan (China)	3.5	6.3	12.9	13.0	42.5	18.4	3.4
Lao DPR	2.4	3.0	5.6	6.2	45.2	25.0	12.8
Malaysia	0.6	0.4	0.6	2.1	3.6	9.7	83.1
Myanmar	9.8	7.6	7.0	5.2	29.8	27.4	13.2
Thailand	7.5	13.5	20.6	16.8	29.9	9.3	2.4
Viet Nam	23.1	11.1	12.3	10.7	28.4	12.4	1.9
Total area	8.4	7.8	10.4	9.5	30.2	17.3	16.3
Maximum productivity							
Cambodia	7.2	5.0	4.6	6.6	5.4	4.9	66.2
Yunnan (China)	0.8	1.2	1.3	0.9	2.7	4.3	88.8
Lao DPR	0.9	0.5	0.6	0.5	1.3	1.7	94.6
Malaysia	0.2	0.1	0.1	1.2	0.3	0.3	97.9
Myanmar	5.4	4.3	3.8	1.8	2.7	2.5	79.5
Thailand	2.9	2.5	4.0	6.1	10.7	10.7	63.1
Viet Nam	13.0	4.2	4.0	2.5	5.1	5.9	65.3
Total area	4.3	2.7	2.8	2.7	4.3	4.6	78.6

TABLE A9.4

Population and woodfuel balance – percentage of country total populations living in different supply/demand balance conditions under the GFPOS-trend consumption scenario

	High deficit	Medium-high deficit	Medium-low deficit	Balanced	Medium-low surplus	Medium-high surplus	High surplus
Mean productivity							
Cambodia	46.5	21.7	12.1	4.8	6.3	4.1	4.6
Yunnan (China)	9.2	10.7	13.1	7.8	15.6	13.5	30.1
Lao DPR	29.1	6.9	8.0	4.2	9.1	9.9	32.8
Malaysia	20.8	5.8	6.2	2.3	5.9	4.7	54.4
Myanmar	50.0	18.9	10.3	3.3	5.0	3.6	8.8
Thailand	38.6	17.1	14.7	6.4	9.5	5.7	7.9
Viet Nam	67.4	10.8	6.7	2.9	4.5	3.4	4.3
Total area	43.3	13.6	10.2	4.5	7.6	5.7	15.0
Minimum productivity							
Cambodia	55.3	23.4	12.0	4.1	4.6	0.5	0.1
Yunnan (China)	15.8	23.7	24.5	13.4	18.0	4.1	0.5
Lao DPR	34.5	13.2	14.9	8.3	21.3	6.4	1.4
Malaysia	30.0	13.1	7.8	3.4	11.9	12.9	21.0
Myanmar	59.5	20.4	9.8	3.1	4.8	1.9	0.5
Thailand	50.1	25.5	15.0	4.5	3.7	1.0	0.4
Viet Nam	77.3	11.4	6.0	2.4	2.4	0.4	0.1
Total area	52.7	18.6	12.0	4.9	6.8	2.7	2.2
Maximum productivity							
Cambodia	39.0	17.7	12.0	5.4	7.7	5.4	12.7
Yunnan (China)	7.0	4.1	6.3	4.0	9.5	10.9	58.3
Lao DPR	24.4	4.5	3.8	2.7	6.2	7.1	51.2
Malaysia	14.0	4.2	2.8	2.2	4.3	4.5	68.1
Myanmar	41.6	16.4	10.2	3.9	5.7	4.2	17.9
Thailand	30.3	10.7	10.6	5.5	11.3	8.6	23.0
Viet Nam	57.8	9.0	6.7	2.8	5.5	4.6	13.6
Total area	35.7	9.8	7.9	3.8	7.4	6.4	28.8

TABLE A9.5

Percentage of country sparse rural populations (<2000 inh/km²) living under different supply/demand balance conditions – GFPOS-trend consumption scenario

	High deficit	Medium-high deficit	Medium-low deficit	Balanced	Medium-low surplus	Medium-high surplus	High surplus
Mean productivity							
Cambodia	16.7	26.4	20.0	8.2	11.6	7.9	9.2
Yunnan (China)	1.3	4.7	6.1	4.7	13.9	16.9	52.4
Lao DPR	4.2	5.5	8.5	5.5	12.3	13.8	50.3
Malaysia	0.1	0.2	0.2	0.6	0.9	1.7	96.3
Myanmar	21.9	26.4	16.2	4.8	7.7	5.9	17.0
Thailand	9.0	18.8	21.7	10.7	16.1	9.5	14.2
Viet Nam	35.6	14.4	11.9	5.7	10.5	8.9	13.0
Total area	15.8	16.0	14.1	6.5	11.6	9.5	26.5
Minimum productivity							
Cambodia	24.6	34.1	22.3	8.3	9.5	1.1	0.3
Yunnan (China)	4.0	12.0	22.4	18.6	33.4	8.7	1.0
Lao DPR	8.3	14.3	20.0	12.1	33.1	10.1	2.2
Malaysia	0.7	1.5	3.2	2.6	8.4	17.4	66.2
Myanmar	32.9	30.2	16.6	5.5	9.5	4.2	1.1
Thailand	19.3	35.8	26.4	8.4	7.2	2.0	0.8
Viet Nam	48.8	20.7	14.0	6.9	7.9	1.6	0.2
Total area	24.7	24.6	19.2	9.0	13.3	4.6	4.5
Maximum productivity							
Cambodia	10.4	19.1	17.0	8.2	12.2	9.0	24.0
Yunnan (China)	0.4	1.9	2.8	1.9	5.1	7.0	81.0
Lao DPR	1.8	2.3	3.1	2.5	6.3	8.7	75.2
Malaysia	0.0	0.0	0.1	0.4	0.2	0.4	98.9
Myanmar	13.5	21.1	15.5	6.0	8.3	5.9	29.7
Thailand	3.7	8.7	11.8	8.0	16.9	13.8	37.1
Viet Nam	26.2	9.4	8.3	4.5	9.0	8.5	34.1
Total area	10.1	10.2	9.7	5.2	9.8	8.7	46.3

TABLE A9.6

Population and woodfuel balance – percentage of country total populations living in different supply/demand balance conditions under the BAU consumption scenario

	High deficit	Medium-high deficit	Medium-low deficit	Balanced	Medium-low surplus	Medium-high surplus	High surplus
Mean productivity							
Cambodia	64.7	13.0	7.6	3.0	4.6	3.0	4.0
Yunnan (China)	24.5	12.5	9.6	5.7	11.5	10.5	25.7
Lao DPR	35.0	6.9	6.3	3.9	8.3	8.6	30.9
Malaysia	32.7	6.3	3.5	2.1	3.1	3.6	48.8
Myanmar	62.7	13.4	6.7	2.4	3.8	3.0	8.0
Thailand	42.4	12.7	13.5	6.9	10.2	6.0	8.3
Viet Nam	74.0	8.1	5.2	2.2	3.7	2.9	3.9
Total area	52.7	10.7	7.9	3.8	6.4	4.9	13.5
Minimum productivity							
Cambodia	71.1	14.5	7.1	3.0	3.7	0.5	0.1
Yunnan (China)	35.9	19.1	18.1	9.5	13.9	3.2	0.4
Lao DPR	40.8	12.2	13.2	7.1	19.5	5.9	1.3
Malaysia	44.2	6.3	6.2	3.8	10.2	11.7	17.6
Myanmar	70.2	14.2	6.8	2.5	4.1	1.8	0.5
Thailand	51.0	21.9	16.3	5.2	4.1	1.1	0.4
Viet Nam	81.9	8.6	4.9	2.0	2.1	0.4	0.0
Total area	61.4	14.2	10.1	4.2	5.9	2.4	1.9
Maximum productivity							
Cambodia	57.6	12.3	7.5	3.2	5.1	3.5	10.6
Yunnan (China)	16.1	9.0	6.7	3.4	7.5	8.0	49.4
Lao DPR	30.1	4.1	4.5	2.1	5.6	5.0	48.6
Malaysia	25.0	4.4	3.2	1.2	2.8	2.9	60.6
Myanmar	54.7	12.2	7.5	2.9	4.1	3.1	15.5
Thailand	35.9	7.6	8.3	5.3	10.6	9.0	23.2
Viet Nam	65.4	7.5	4.9	2.3	4.3	3.7	11.7
Total area	44.9	8.4	6.3	3.2	6.0	5.3	25.7

TABLE A9.7

Percentage of country sparse rural populations (<2000 inh/km²) living under different supply/demand balance conditions – BAU consumption scenario

	High deficit	Medium-high deficit	Medium-low deficit	Balanced	Medium-low surplus	Medium-high surplus	High surplus
Mean productivity							
Cambodia	36.1	21.3	13.7	5.6	8.9	6.2	8.2
Yunnan (China)	4.5	6.2	7.1	5.2	13.6	15.9	47.5
Lao DPR	8.0	6.9	7.8	5.2	11.6	12.4	48.0
Malaysia	0.2	0.2	0.4	0.6	1.3	2.1	95.2
Myanmar	35.3	21.6	11.5	4.0	6.5	5.2	15.8
Thailand	8.4	15.1	20.9	11.9	18.1	10.5	15.0
Viet Nam	42.9	12.7	10.3	4.8	9.1	8.1	12.1
Total area	21.9	13.7	12.3	6.4	11.3	9.1	25.3
Minimum productivity							
Cambodia	45.5	25.1	14.2	6.2	7.7	1.0	0.3
Yunnan (China)	9.7	15.1	23.6	16.1	27.6	7.0	0.9
Lao DPR	13.2	15.2	18.9	10.8	30.6	9.3	2.1
Malaysia	1.0	2.5	3.5	3.3	8.8	18.9	61.9
Myanmar	45.6	24.0	12.3	4.5	8.6	3.9	1.1
Thailand	16.6	32.3	29.6	10.1	8.3	2.3	0.9
Viet Nam	55.2	17.7	12.2	6.1	7.2	1.5	0.2
Total area	30.5	21.8	18.5	8.5	12.1	4.4	4.3
Maximum productivity							
Cambodia	27.9	17.7	12.4	5.7	8.9	6.8	20.5
Yunnan (China)	1.9	3.4	3.2	2.1	5.3	7.3	76.9
Lao DPR	4.3	3.4	4.1	2.2	6.8	7.0	72.2
Malaysia	0.0	0.0	0.1	0.4	0.2	0.4	98.8
Myanmar	25.4	18.8	12.5	4.4	6.4	5.0	27.6
Thailand	4.2	6.8	10.2	7.6	17.1	15.0	39.1
Viet Nam	32.8	9.2	7.4	4.0	8.0	7.4	31.4
Total area	15.5	9.4	8.2	4.5	9.1	8.4	44.8

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Current (2000) and projected (2015) woodfuel consumption patterns and supply potentials in continental Southeast Asia are analysed and mapped applying the Woodfuel Integrated Supply/Demand Overview Mapping (WISDOM) methodology. Combined with poverty data, the study helps define areas where poor rural and suburban populations that depend primarily on woodfuels for their subsistence energy supply are likely to suffer severe shortages, adding an indicator to the mapping of extreme poverty and a new tool for poverty alleviation policies and forestry and energy development planning. Integrating several cartographic layers with multi-source

field data provides maps of woody biomass stocking and potential sustainable productivity in 2000 and 2015 at a spatial resolution of less than 1 km. Woody biomass consumption maps matching the resolution of supply maps, coupled with likely population distribution in 2015 and model projections of woodfuel consumption, give future consumption scenarios. Combining these yields balance maps of woodfuel deficit and surplus areas. This study is a starting point for expanding work in the agro-energy sector, which can benefit from the approach, the GIS analytical environment, the additional thematic layers and the nexus with forestry, energy and poverty alleviation issues.



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