



Mae Fah Luang Foundation under Royal Patronage



Thailand Voluntary Emission Reduction (T-VER) for forest conservation and reforestation

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9 November 2017



Contents

- Mae Fah Luang Foundation
- Doi Tung Development project
- Thailand Voluntary Emission Reduction (T-VER)
- T-VER: Project level REDD+



Mae Fah Luang Foundation

- improves the lives of people living in poverty and deprived of livelihood opportunities
- ‘helps people to help themselves’ in a sustainable manner
- fosters harmony between humans and nature

The Doi Tung Development Project



Total area of 150 Sq. km.

29 villages; 5 sub-district; 2 districts

Population 11,000

6 ethnic groups

Union of Myanmar



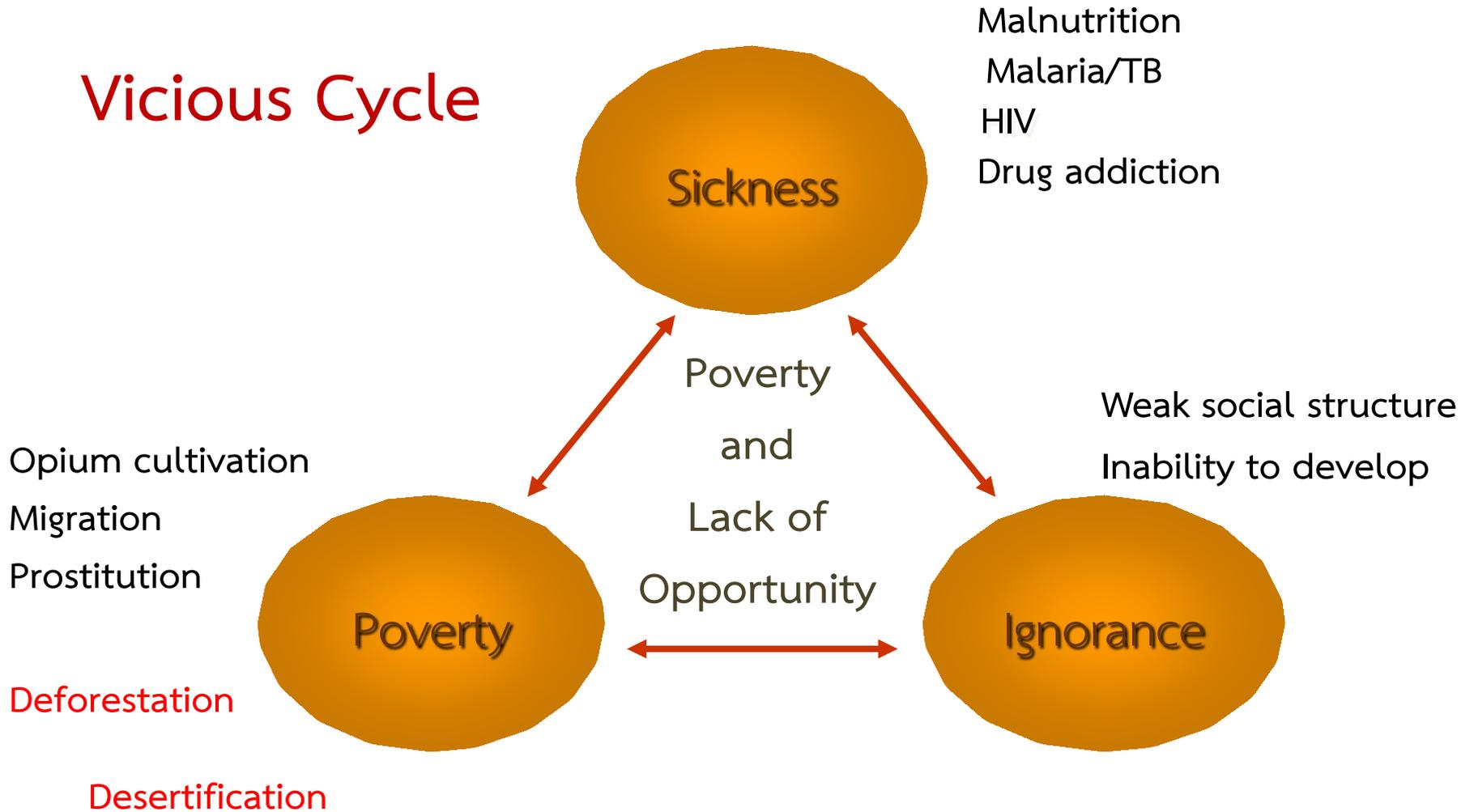
Doi Tung, Northern Thailand

1988

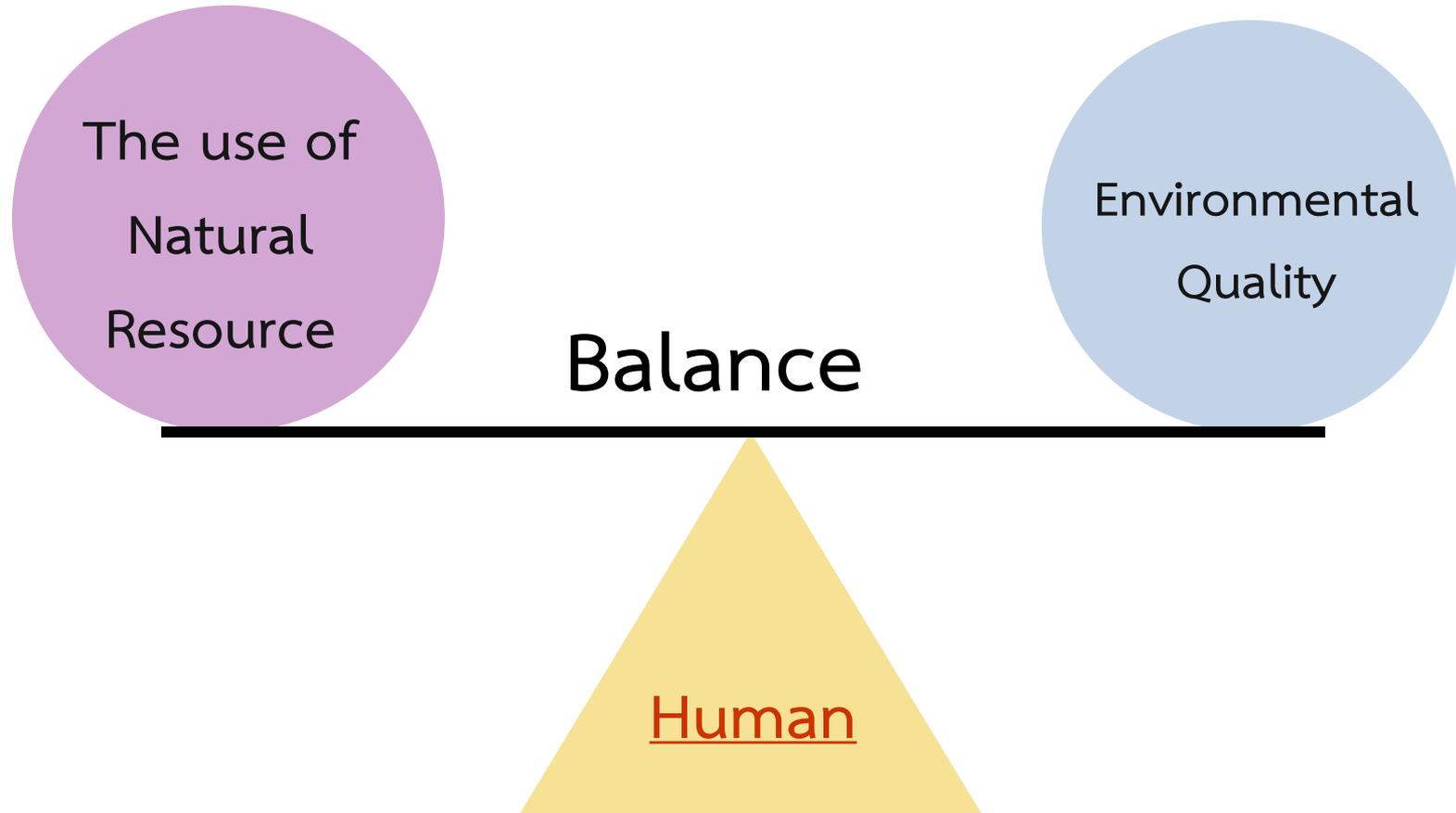


Recognizing the Problem

Vicious Cycle



Co-Existence of Humans and Nature



“People and Nature Must Co-Exist in Harmony, Interdependently”

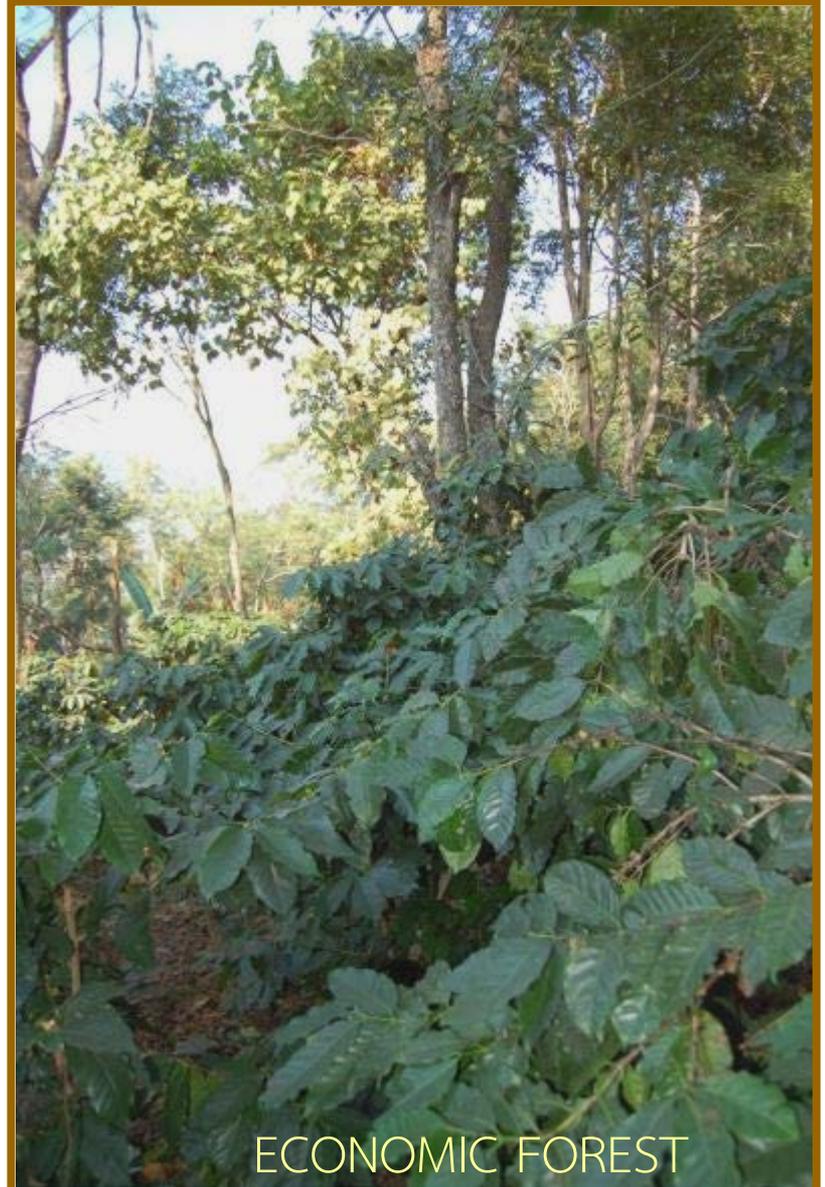
CONSERVATION FOREST



SUSTENANCE FOREST



ECONOMIC FOREST



Humans and Nature Living in Harmony



Economic Forest



Maximizing limited resources:

Moving up the Value Chain



Coffee cherry €0.5/kg



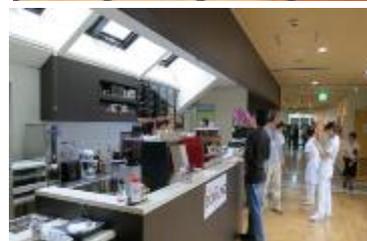
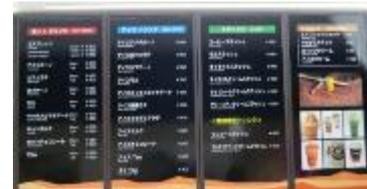
Green beans €4 /kg



Roasted beans €20 BHT/kg



Packaged coffee €32 BHT/kg



Doi Tung Café €230 BHT/kg

Creating Value for Everything

Macadamia
Coffee Topping



Shell used as
Bio renewable
Energy Source



Compost



Roasted Macadamia



Odor Absorbing Coal

Macadamia Honey and Spread



Macadamia Ice Cream

Diversifying Risks



Food

Handicrafts

DOITUNG
Lifestyle for Livelihood™

Horticulture

Tourism



Doi Tung as a Social Enterprise

- Financial self-sustainability since 2000
- Annual income of approx. €20 million
- Almost 1,700 employees

All profit is ploughed back for social development



**SCHWAB FOUNDATION FOR
SOCIAL ENTREPRENEURSHIP**

Social Entrepreneur of the Year

2009 Asia Region

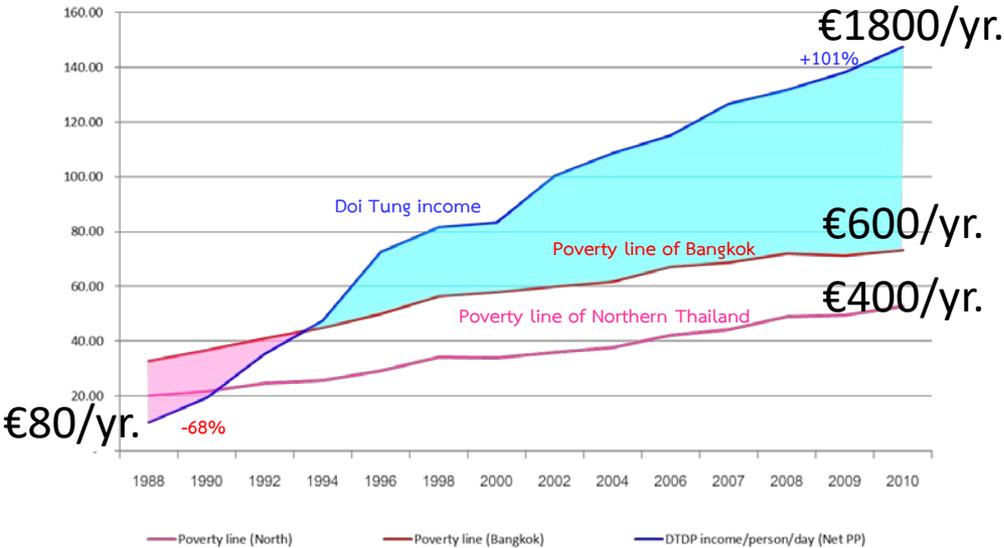


UNITED NATIONS
Office on Drugs and Crime

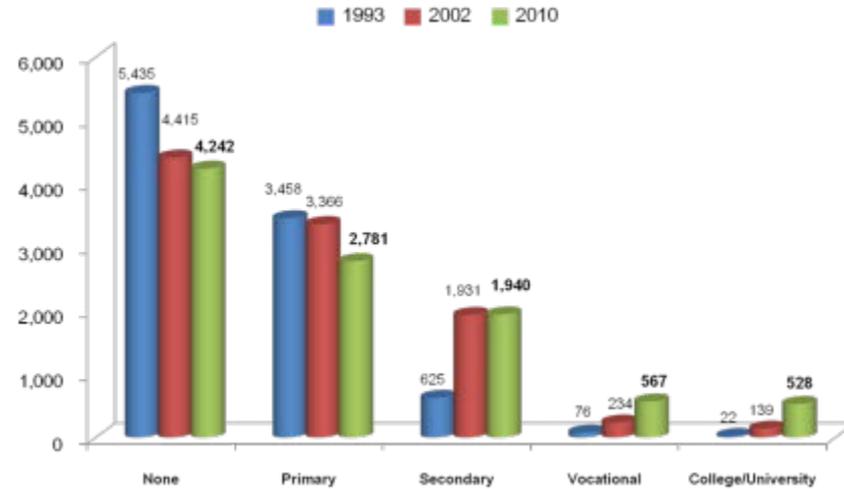
The sale of this product contributes to the achievement of drug free world. Through alternative sustainable development, villagers who once depended on opium production and use can now earn secure legitimate incomes by making these products.

Accountability

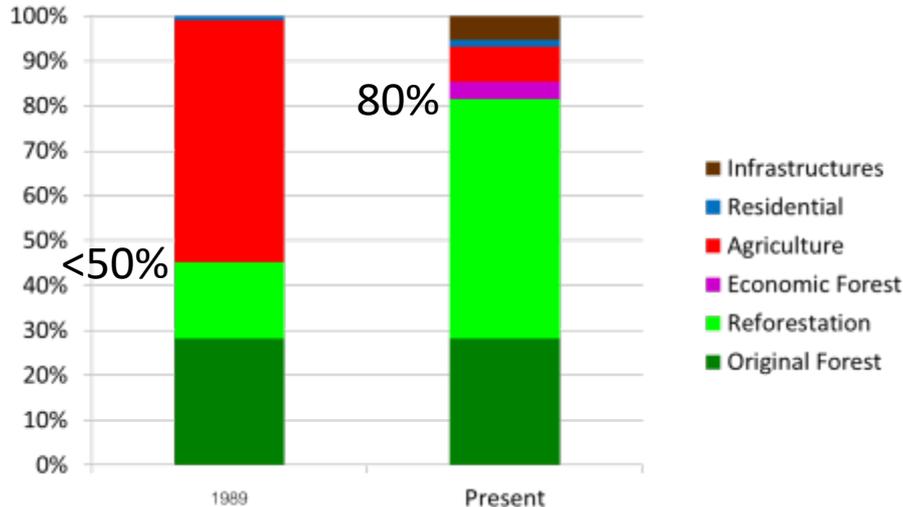
Economic: Per Capita Income Increase



Social: Higher Level of Education



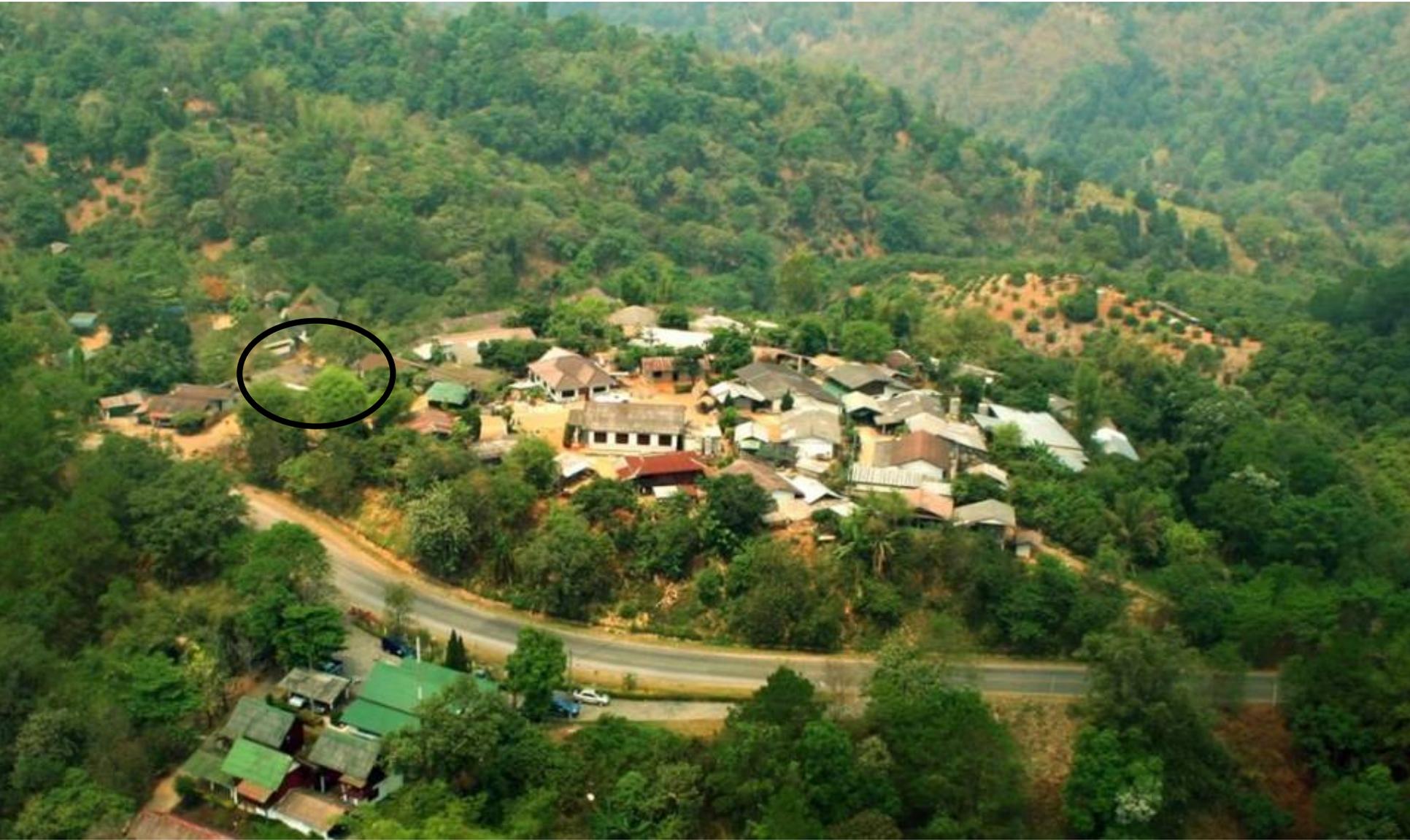
Environmental: Forest Regeneration



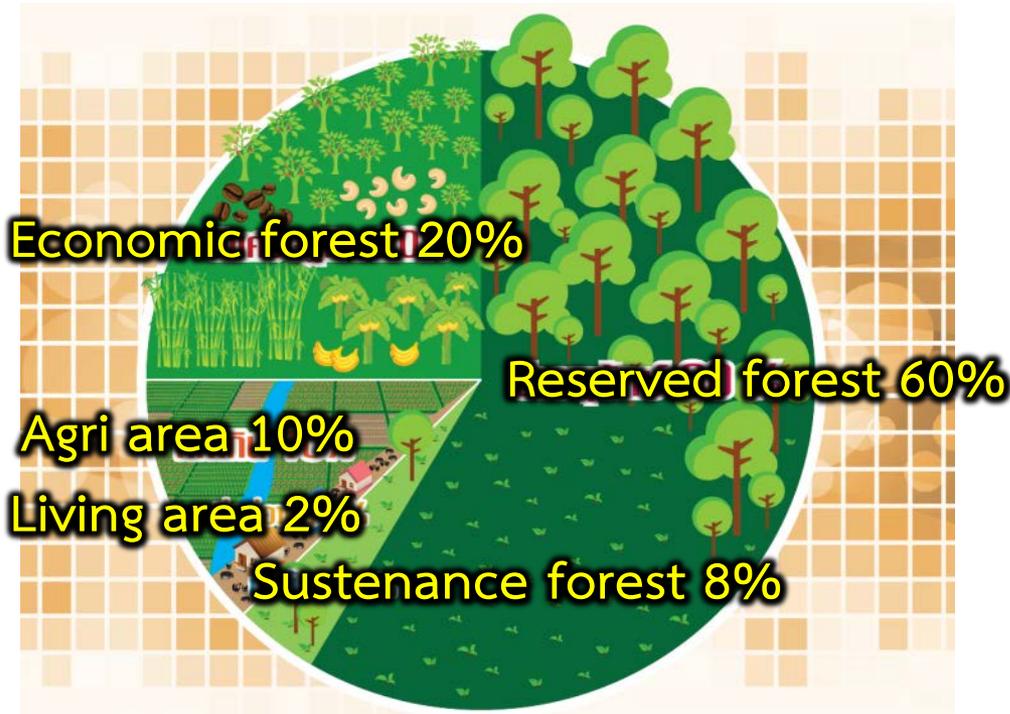
KPI:

“WHAT DO THE PEOPLE GET?”

DOI TUNG: Past to Present



“Doi Tung model”



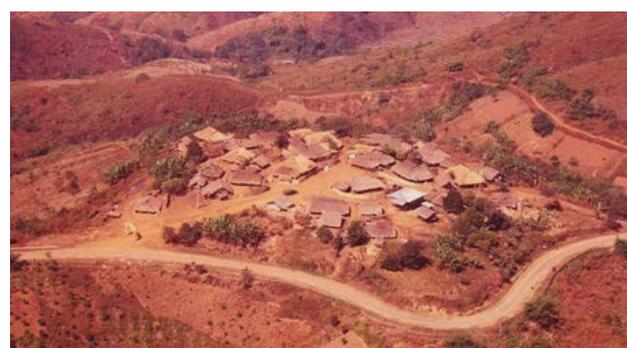
“Cultivate People, Cultivate Land”

- Increase income from varieties of sources (economic forest, livestock)
- Improve health (reduce chemical use)
- Improve self-esteem
- Improve community engagement (regulation on land use and irrigation)
- No further encroachment
- Reduce forest fire
- Increase biodiversity



Sustainable Reforestation projects of Mae Fah Luang Foundation

1. Doi Tung Development Project, Chiang Rai province (1988-2019)
2. Pangmahun and Puna reforestation project (FPT 33), Chiang Rai province (2005-2009)
3. Nan reforestation project, Nan province (2009-2017)



Doi Tung

14,900 ha.

11,000 pp in 29 villages



Pangmahun and Puna

6,200 ha.

10,900 pp. in 30 villages



3 Districts in Nan

40,000 ha.

8,600 pp in 20 villages



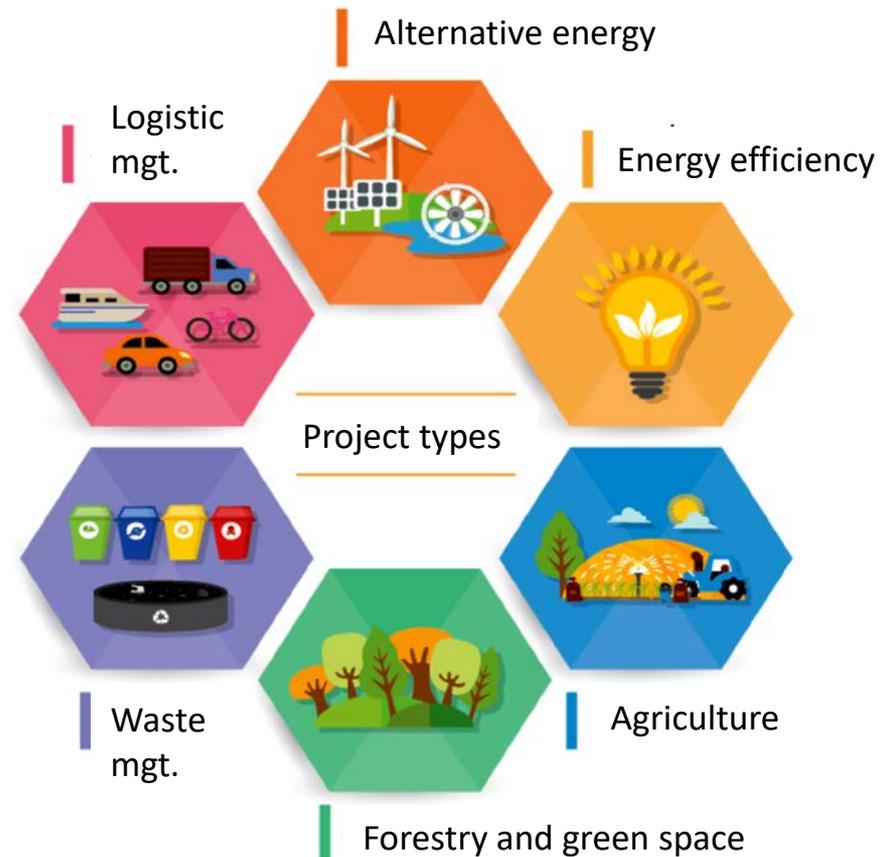
Why Carbon credit and T-VER ?



- To **ensure the continuity** of forest conservation after project handover
- To **provide MRV** for the projects
- **Cost cheaper and faster** to develop a project (vs. VCS, CDM, Gold Std.)
- To promote **carbon market in Thailand**
- Promote the cooperation to reduce carbon emission within Thailand
- Prepare all stakeholders for future emission reduction mechanism eg. carbon tax, cap-and-trade, etc.

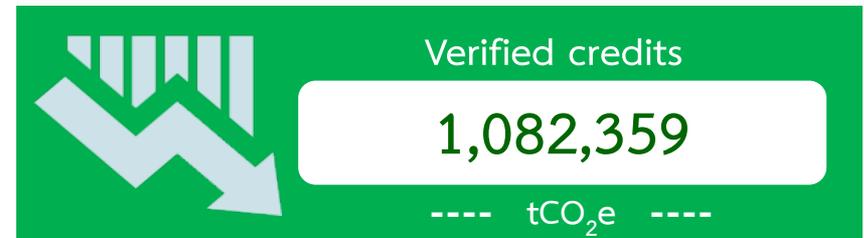
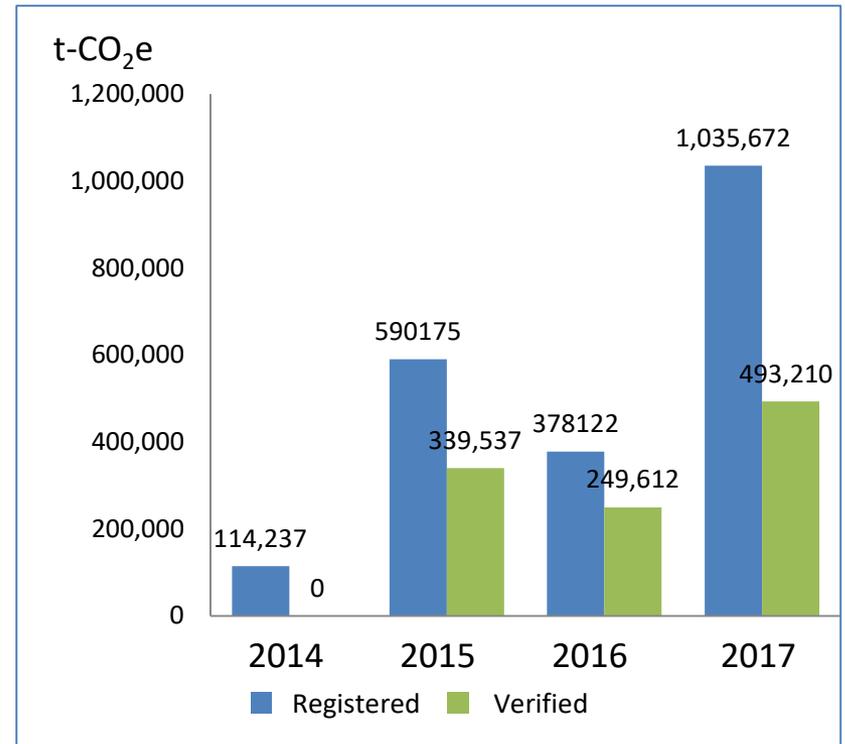
Thailand Voluntary Emission Reduction (T-VER)

- TGO's Scheme to produce and voluntarily buy carbon credit in Thailand following ISO 14064-2 standard
- Validated and Verified by an independent Validation and Verification Body (VVB) registered with TGO following ISO 14064-3 standard /Accredited by 2018
- Type of greenhouse gas: CO₂, CH₄, and N₂O (1 TVERs = 1 t-CO₂e)

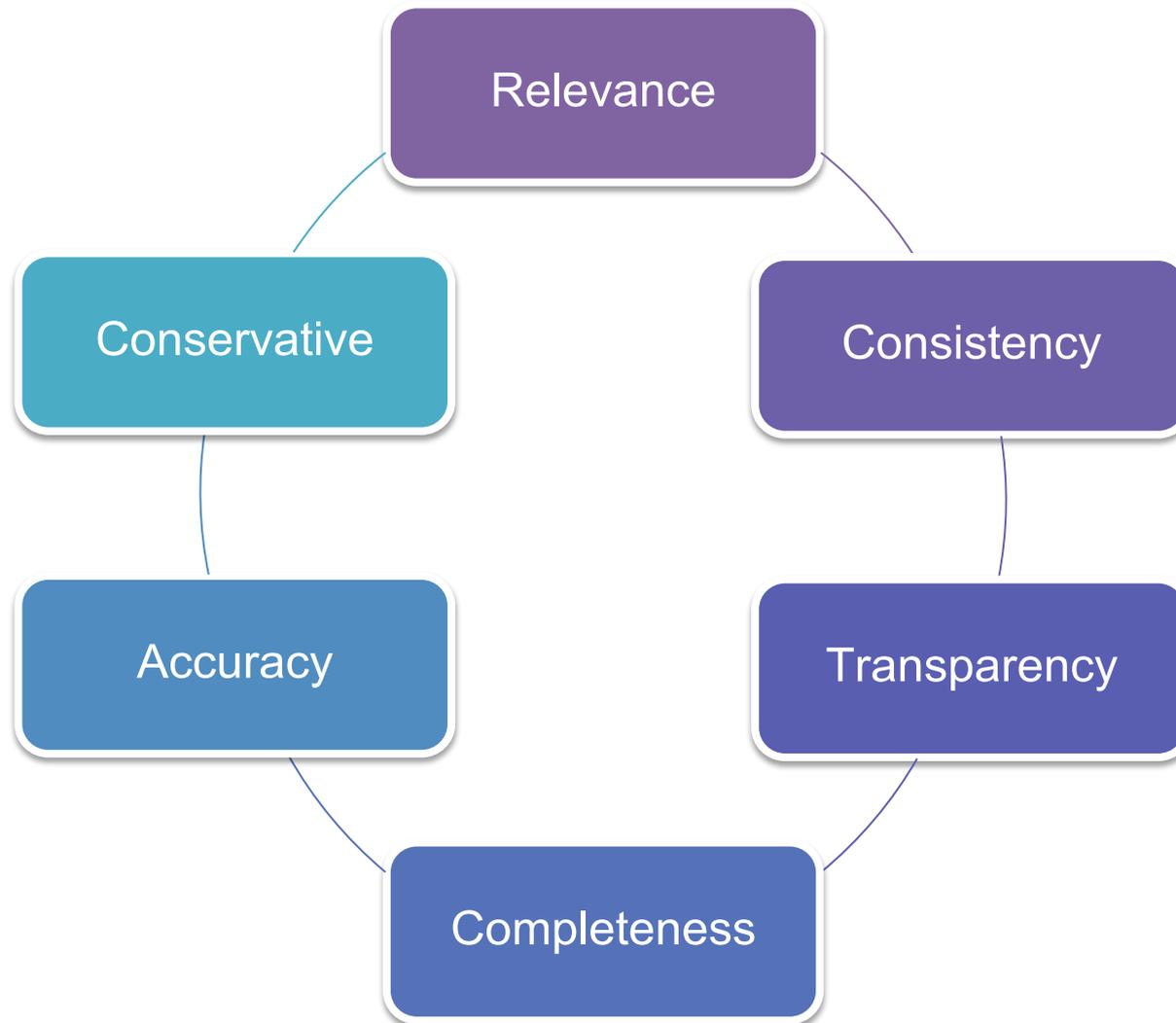


Thailand Voluntary Emission Reduction (T-VER)

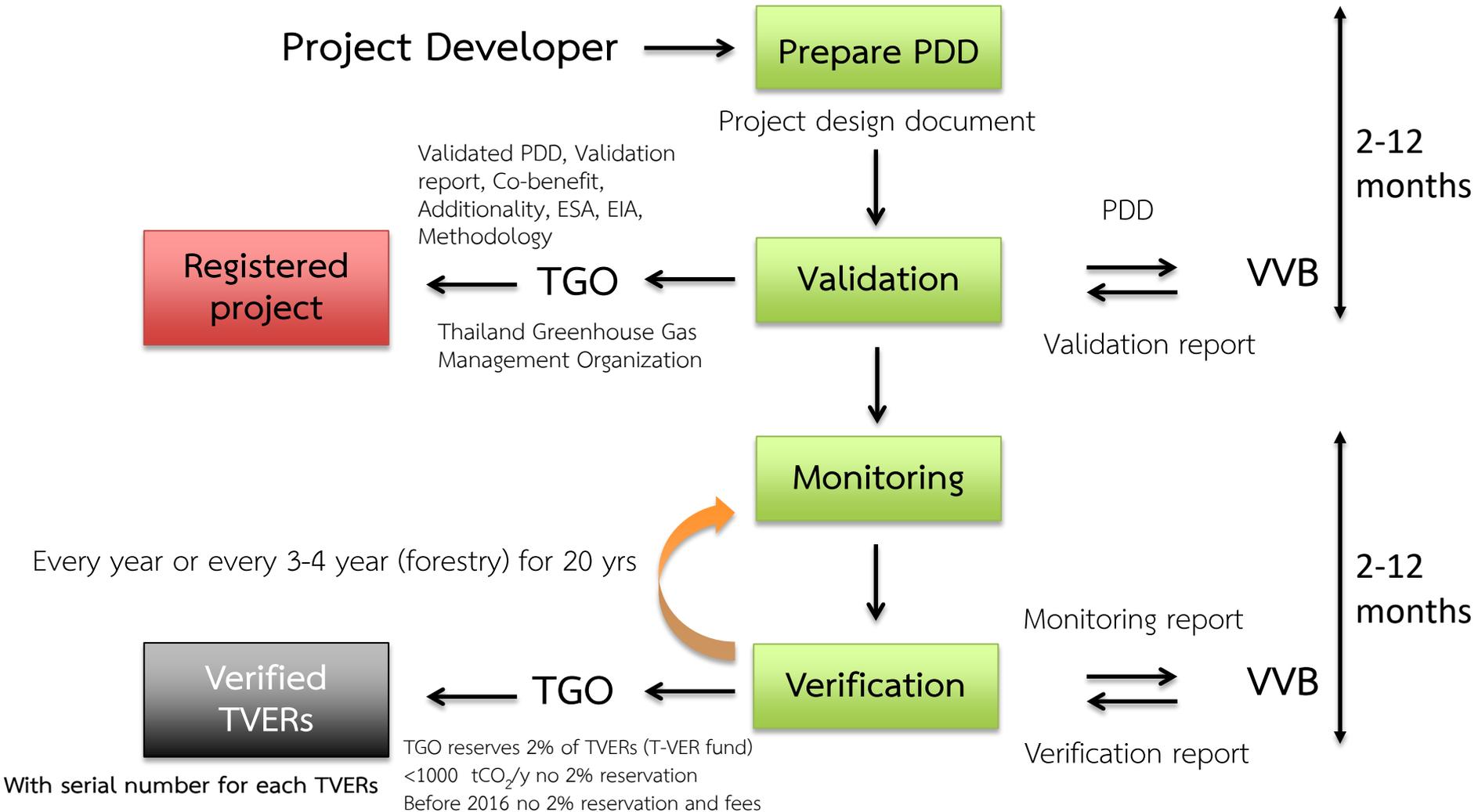
- 2014 - Oct. 2017
- 34 methodologies
- 41 VVBs from 17 organizations
- 80 projects registered (67% energy related 19% waste mgt. 10% forestry); 8 forestry projects
- Forestry to reduce 157,420 t-CO₂/y
- 32 projects verified (2 forestry projects)



Principles of T-VER (ISO 14064-2)



Registration and Verification process for T-VER project



T-VER Methodologies for Forestry Projects

Methodologies	Project types and sizes
T-VER-METH-FOR-01: Sustainable Forestation	Carbon sequestered by an increase in biomass / Size: less than 16,000 t-CO ₂ e/year (about 2,700 ha) / No leakage calculation
T-VER-METH-FOR-02: Reducing Emission from Deforestation and Forest Degradation and Enhancing Carbon Sequestration in Forest Area: Project Level P-REDD+	Prevent deforestation and carbon sequestration by an increase in biomass / Size: not specified / No leakage calculation
T-VER-METH-FOR-03: Large scale Sustainable Forestation Project	Carbon sequestered by an increase in biomass / Size: more than 16,000 t-CO ₂ e/year / Project emission (Land preparation and machine use) / leakage (LUC)
Guidelines and tools:	
1) T-VER and T-VER: forestry and Agriculture sector guidelines	
2) Calculation of carbon sequestration by trees, soil carbon, dead wood and litter	



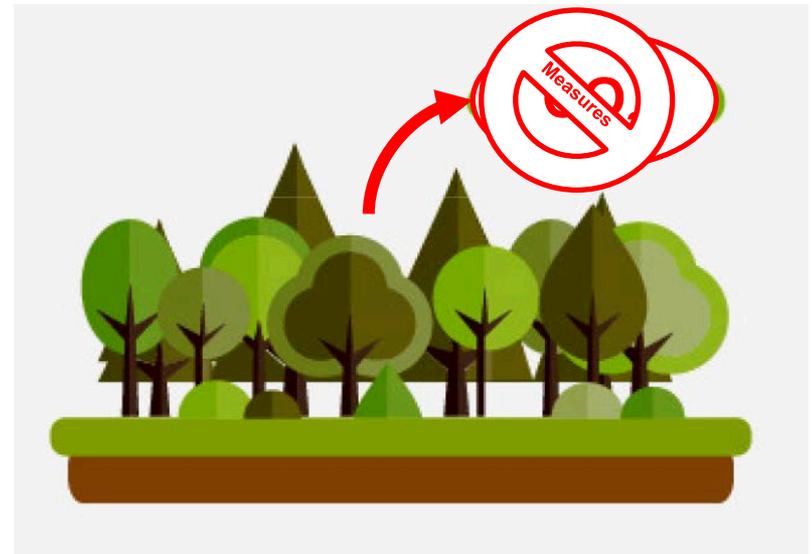


Reducing Emission from Deforestation and Forest Degradation and Enhancing Carbon Sequestration in Forest Area Project Level: P-REDD+ (T-VER-METH-FOR-02)

- **R** = Reducing
- **E** = Emission (from)
- **D** = Deforestation
- **D** = (and) Degradation
- **+** = Conservation, sustainable forest management, and additional carbon sequestration

Activities in REDD+

- 1) Prevent additional forest encroachment
- 2) Prevent forest degradation
- 3) Forest conservation
- 4) Sustainable forest management and
- 5) Reforestation for additional carbon sequestration in the project area



Carbon sequestration in the form of wood

Community participation is needed in every step



Reducing Emission from Deforestation and Forest Degradation and Enhancing Carbon Sequestration in Forest Area Project Level: P-REDD+

(T-VER-METH-FOR-02)

Applicability

1. Have measures to **prevent the forest area from being used** for other purposes and/or
2. Have activities to **reduce the degradation** of forested land and/or
3. Have activities to **increase carbon sequestration** in the forest area

Project conditions

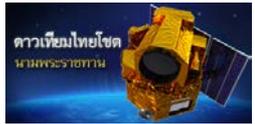
1. The Project area **must be forest area** (area >1 Rai, canopy of > 30%, and the height of fully grown trees > 3 m).
2. Have the **land use rights**
3. **No intention to change original ecosystem** before the project starts
4. Must be an area that has a **tendency to change** from forest to non-forest area
5. In case of reforestation, **indigenous species** must be selected.
6. Proof of **Additionality** proof (large project)
Breakeven > 3 years

Project conditions

1. The Project area **must be forest area** (area >1 Rai (0.16 ha), canopy of > 30%, and the height of fully grown trees > 3 m).



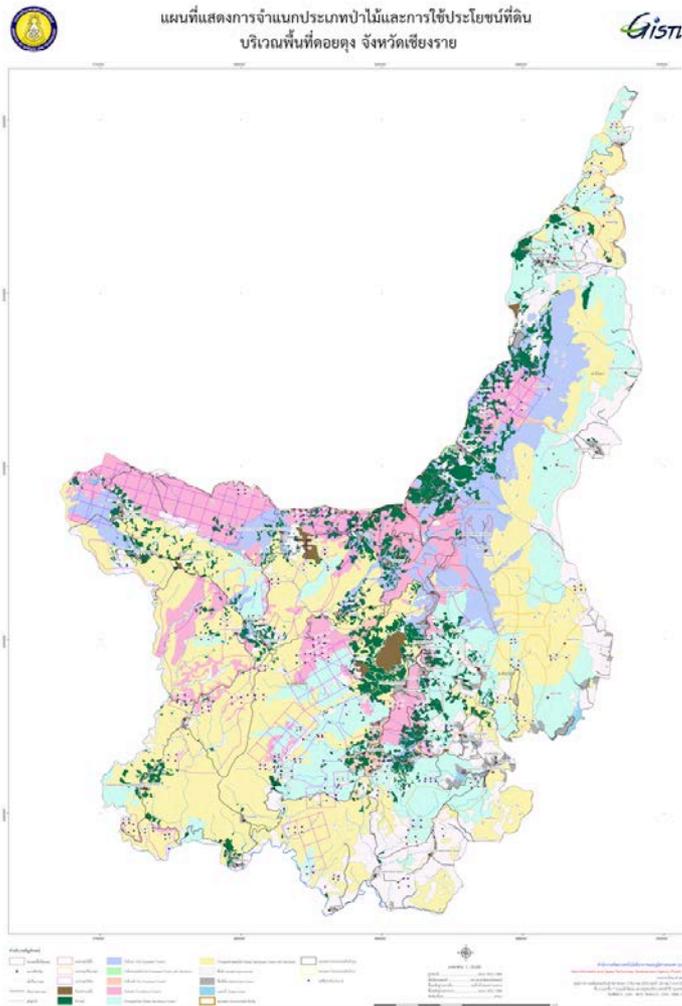
LANDSAT-8



Thaichote

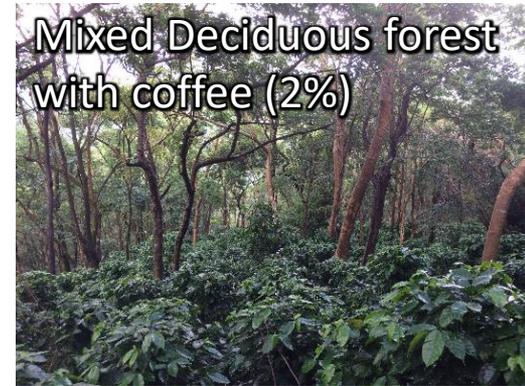


Drone



Land use	Area		
	km ²	%	% of forest
Hill Evergreen Forest	18.73	11.08	13.80
Hill Evergreen Forest with bamboo	0.07	0.04	0.05
Dry Evergreen Forest	1.19	0.70	0.88
Mixed Deciduous Forest	32.28	19.11	23.79
Mixed Deciduous Forest with bamboo	60.94	36.05	44.91
Coniferous Forest	22.47	13.29	16.56
Agricultural Area	27.92	16.52	
Urban Area	4.99	2.95	
Water body	0.43	0.26	
Total	169.02	100.00	
Forest area	135.68	80.27	100.00

Forest types in Doi Tung



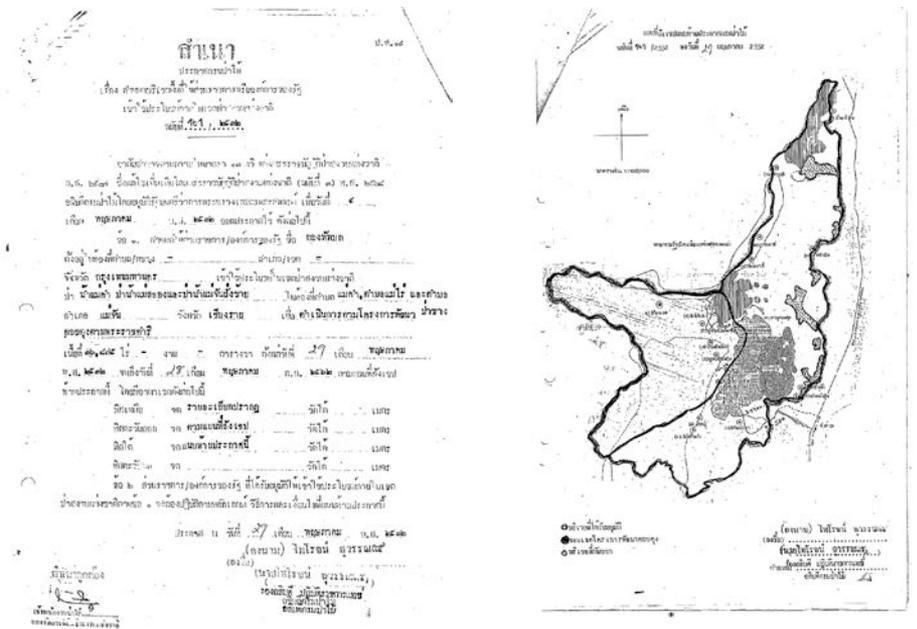
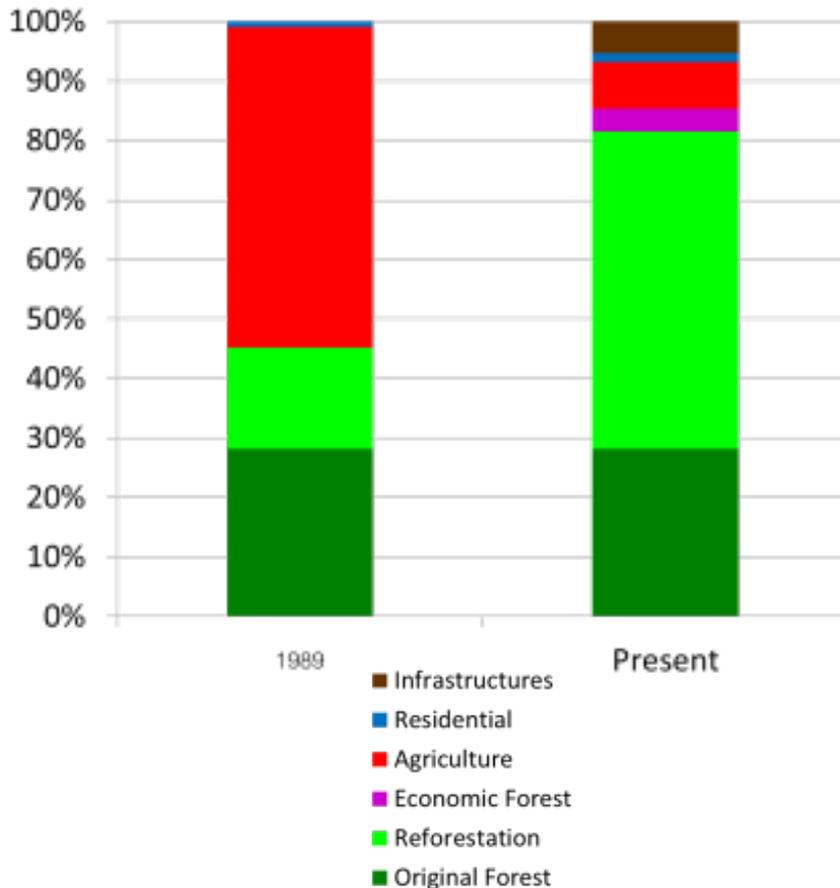
Applicability

1. Have measures to prevent the forest area from being used for other purposes and/or

Project conditions

2. Have the land use rights
3. No intention to change original ecosystem before the project starts

Forest area < 50% → Approx. 80%



- Area with government permits
- Conservation area (Royal forestry dept.)
- Not in Dept. of National Park area

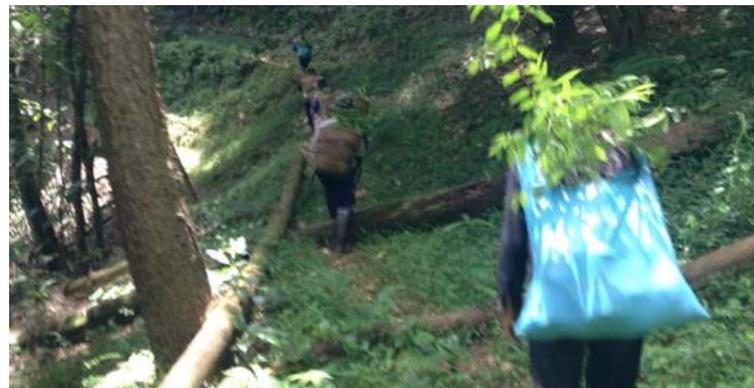
Applicability

2. Have activities to **reduce the degradation** of forested land and/or



Applicability

3. Have activities to **increase carbon sequestration** in the forest area



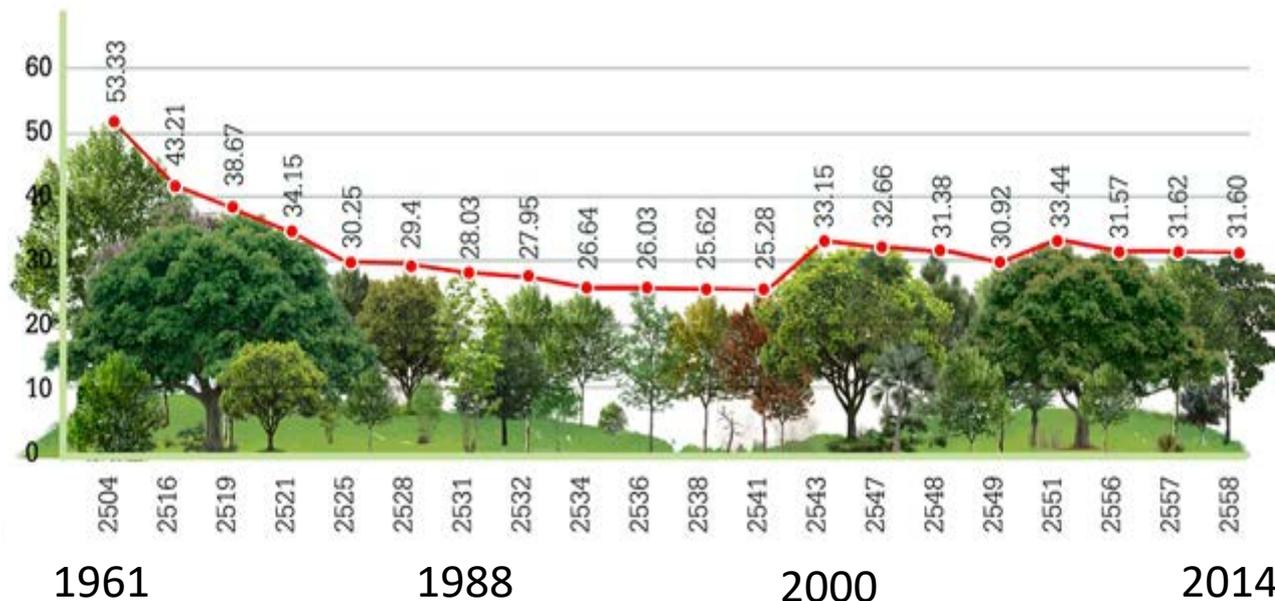
Project conditions

5. In case of reforestation, **indigenous species** must be selected.

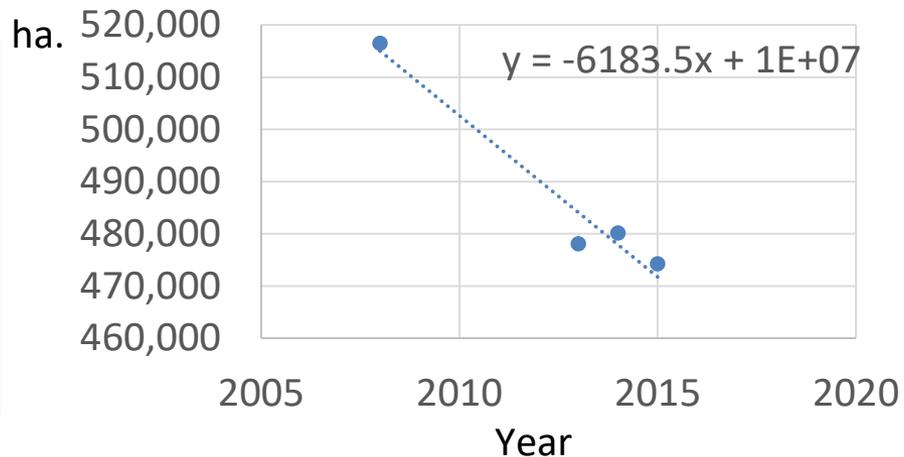
Project conditions

4. Must be an area that has a **tendency to change** from forest to non-forest area

% of forest area in Thailand



Forest area reduction:
 Chiang Rai : 1.2% / yr.
 = 6,016 ha./yr.
 Annual Rate of Conversion (ARC)



Project conditions

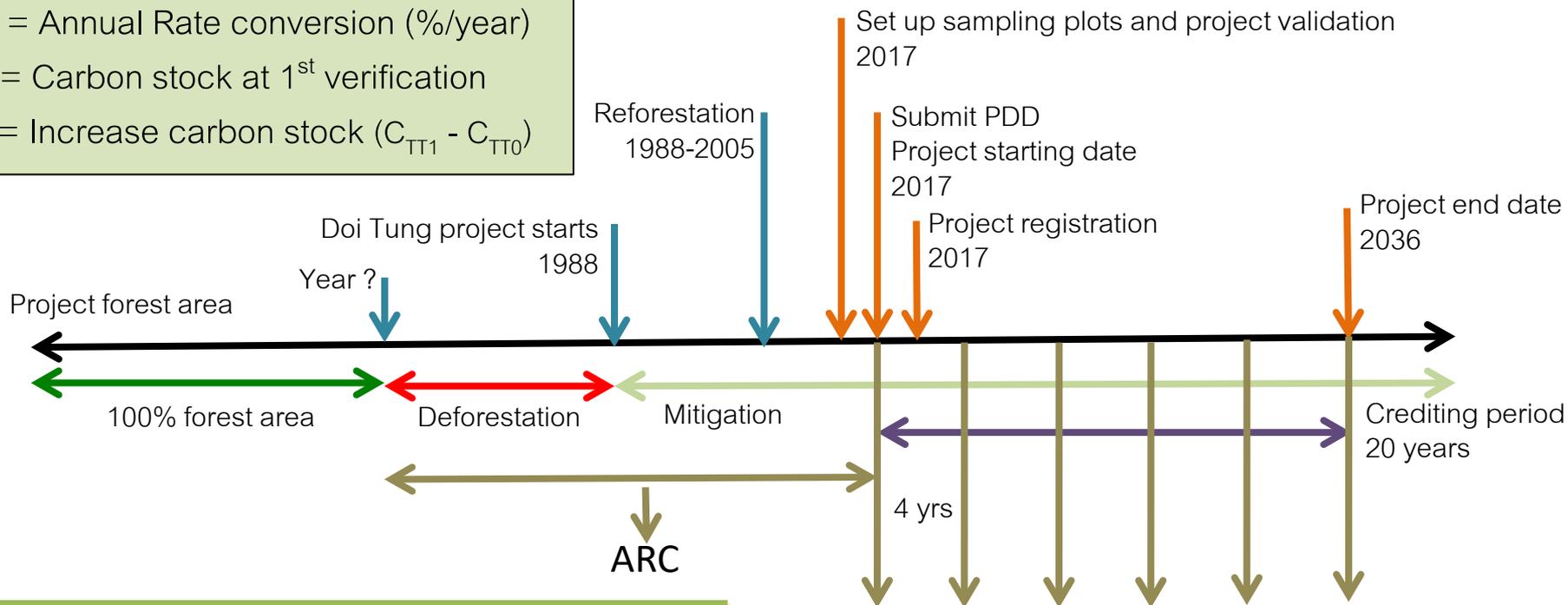
6. Proof of **Additionality** proof (only for large project); Breakeven > 3 years

Activities	2017	2016	2015	Average/ year	20-year payment
Reforestation	€112,500	€51,014	€22,602	€62,039	€1,240,784
Forest fire prevention	€56,200	€32,357	€28,257	€38,938	€778,760
Total	€168,700	€83,372	€50,860	€100,977	€2,019,544

No forestry products from the project
Breakeven point > 3 years

TVERs calculation for P-REDD+

C_{TT0} = Baseline carbon stock
 ARC = Annual Rate conversion (%/year)
 C_{TT1} = Carbon stock at 1st verification
 C_{IC1} = Increase carbon stock ($C_{TT1} - C_{TT0}$)

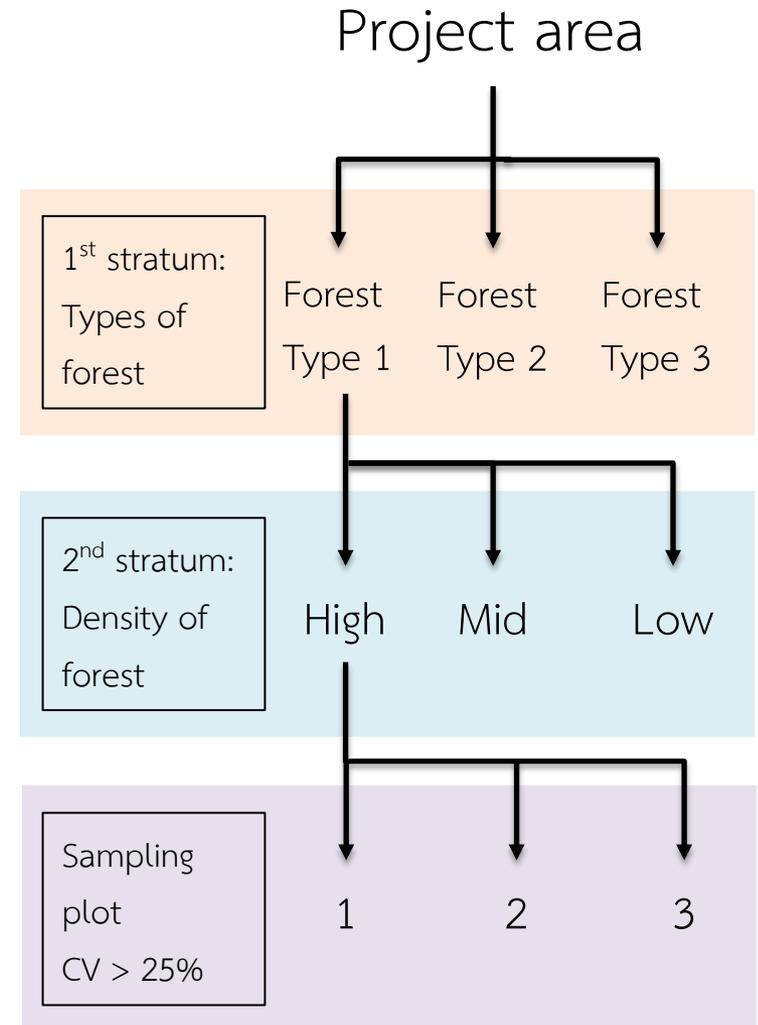


Year	Calculation of TVERs
4	$C_{REDD+1} = 4x(C_{TT0} \times ARC) + (C_{TT1} - C_{TT0})$
8	$C_{REDD+2} = 4x(C_{TT0} \times ARC) + (C_{TT2} - C_{TT1})$
12	$C_{REDD+3} = 4x(C_{TT0} \times ARC) + (C_{TT3} - C_{TT2})$
16	$C_{REDD+4} = 4x(C_{TT0} \times ARC) + (C_{TT4} - C_{TT3})$
20	$C_{REDD+5} = 4x(C_{TT0} \times ARC) + (C_{TT5} - C_{TT4})$

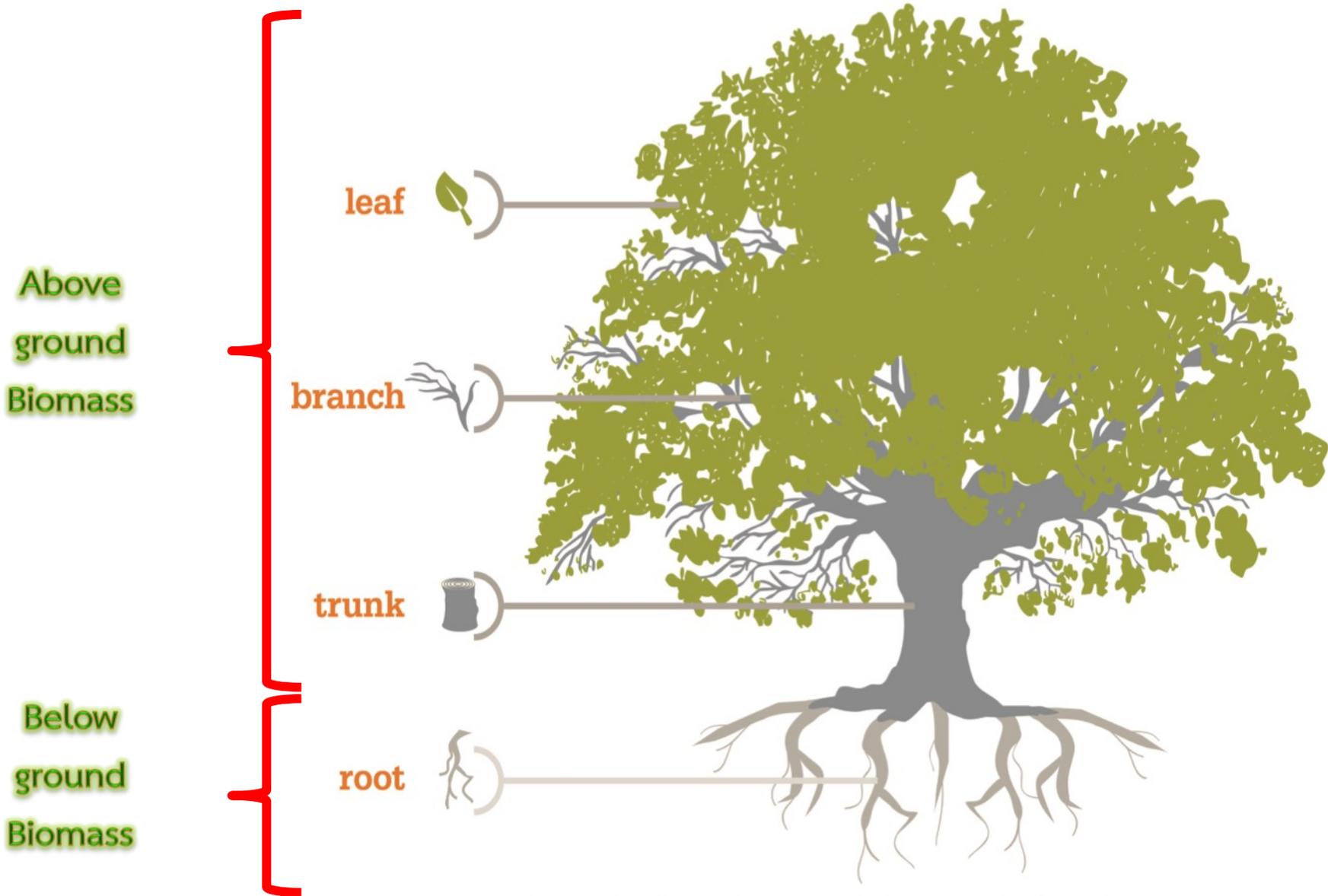


Calculation of baseline carbon stock (C_{TT0})

1. **T-VER area:** satellite images and land survey
 - Area with government permits
 - Not in National Park land
2. **Classify the forest types:** Satellite images and land survey → 1st stratum (Types of forest)
3. Place **sampling plots** at appropriate locations
 - Each sample plot has an area of 1 Rai (0.16 ha)
 - Divide each types of forest into 2nd stratum according to their densities / richness / elevation
 - Each 2nd stratum has >3 different sampling plots
4. **Quantify biomass (t-CO₂e)** in each sampling plot
 - Conduct forest survey (DBH, Height, types of trees)
 - Use appropriate Allometry equations
 - Above ground and below ground biomass
 - Calculate CV of each gr. of sampling plots (CV <25%)
5. Calculate **baseline carbon stock**
 - Avg. biomass value of 3 sampling plots x total area

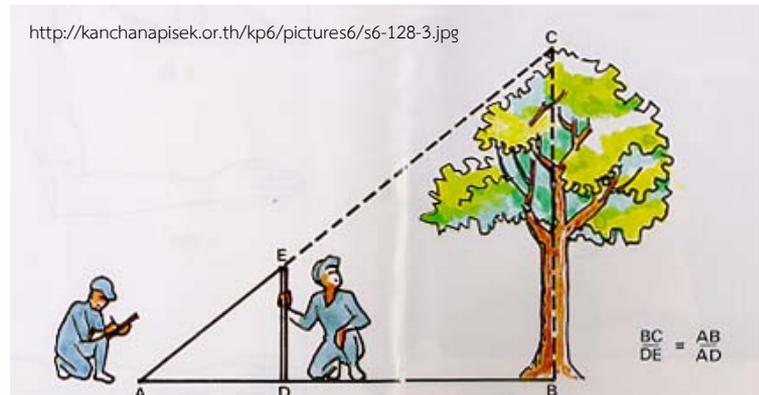
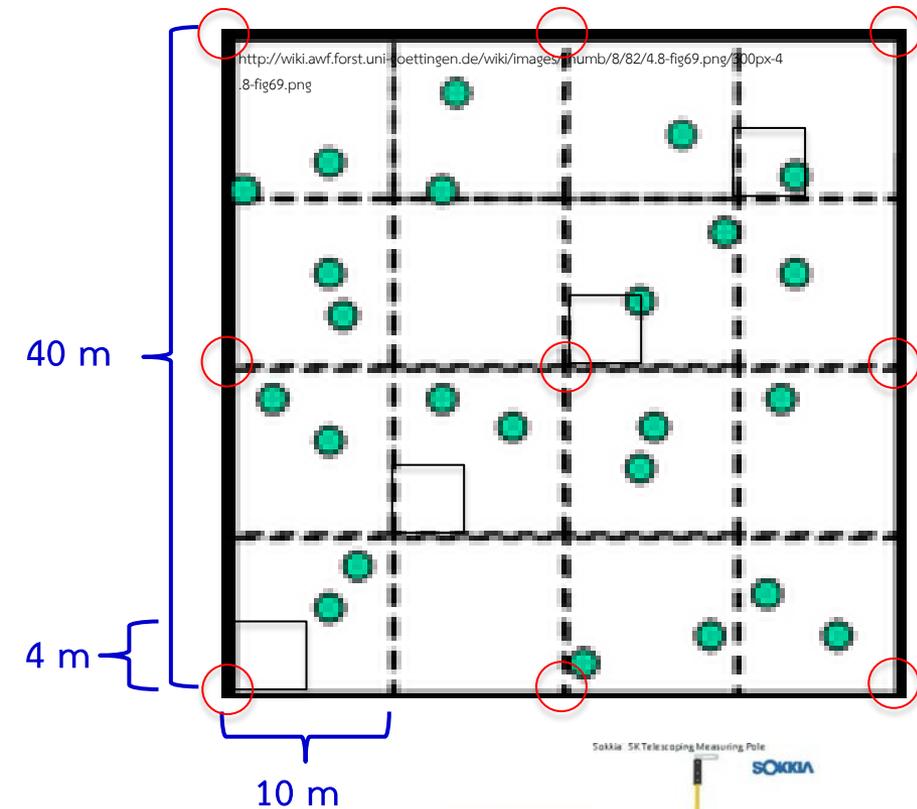


T-VER provides a tool to calculate carbon sequestration



To find Above ground biomass

Step 1: Setting up a sampling plot and collect data (DBH, Height, and types)





Setting up a sampling plot





Tagging and measuring DBH & Height of the trees



Step 2: Choose appropriate Allometry equations and calculate above ground biomass (C_{ABG})

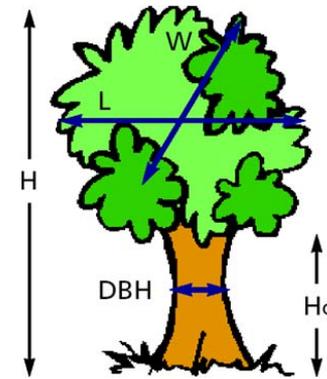
Equations as suggested by TGO

Published equations

- from academic journal
- appropriate for type of forest in the project area

Develop own equations

- need to be approved by TGO



$$w_S = 0.0509 (D^2H)^{0.919}$$

$$w_B = 0.00893 (D^2H)^{0.977}$$

$$w_L = 0.0140 (D^2H)^{0.669}$$

* Dry evergreen forest (Tsutsumi *et al.*, 1983)

$$W_T = W_S + W_B + W_L$$



When

w_T = Total above ground biomass (kg.)

w_S = Above ground biomass - Stem (kg.)

w_B = Above ground biomass - Branch (kg.)

w_L = Above ground biomass - Leaves (kg.)

D = Diameter at Breast Height (cm.), DBH at 1.3 m

H = Tree height (m)

Step 3: Choose appropriate Root-to-Stem ratio to calculate below ground biomass (C_{BLG})

Ratios as suggested by TGO

Published ratios

- from academic journal
- appropriate for type of forest in the project area

Develop own ratios

- need to be approved by TGO

$$\begin{array}{ccc} \text{carbon sequestered} & & \text{root-to-stem} \\ \text{for aboveground} & \times & \text{ratio} \\ \text{biomass} & & \\ (C_{ABG}) & & (R) \end{array}$$

27% of above ground biomass for most trees

Step 4: Calculate biomass in the sample plot

Total biomass

(C_{TT})



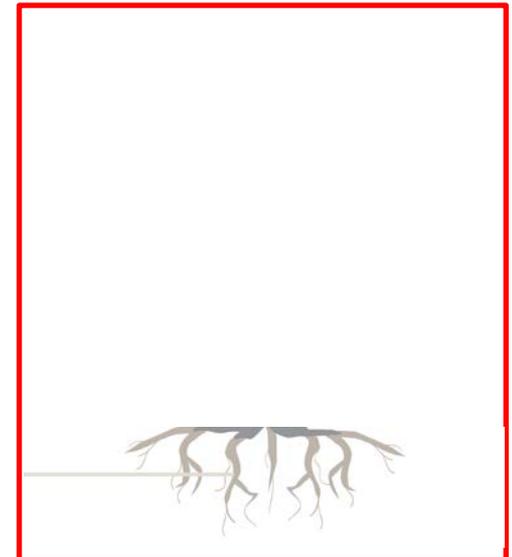
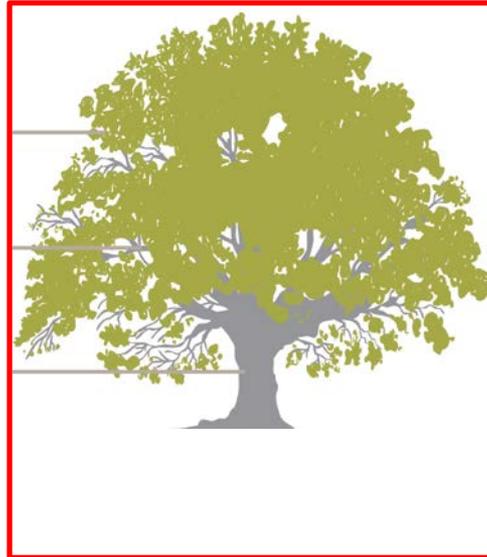
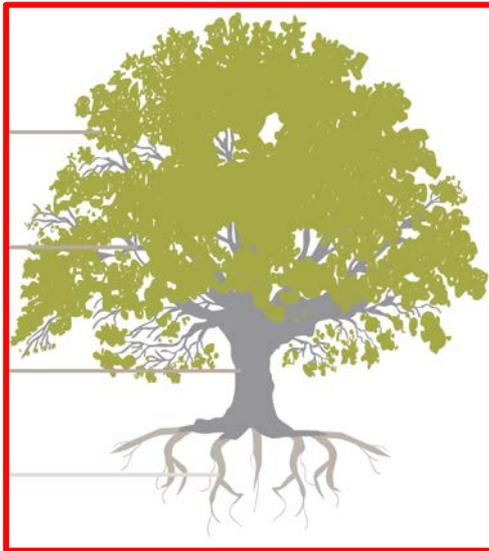
Aboveground
biomass

(C_{ABG})



Belowground
biomass

(C_{BLG})



Step 5: Calculate carbon sequestered in the forest

$$\text{Biomass in a sample plot (M)} \times \frac{\text{Project area (or forest area) (A)}}{\text{Sample plot area (a)}} \times \text{Carbon fraction (CF)} \times \frac{44}{12}$$

Molecular weight of CO_2 / C

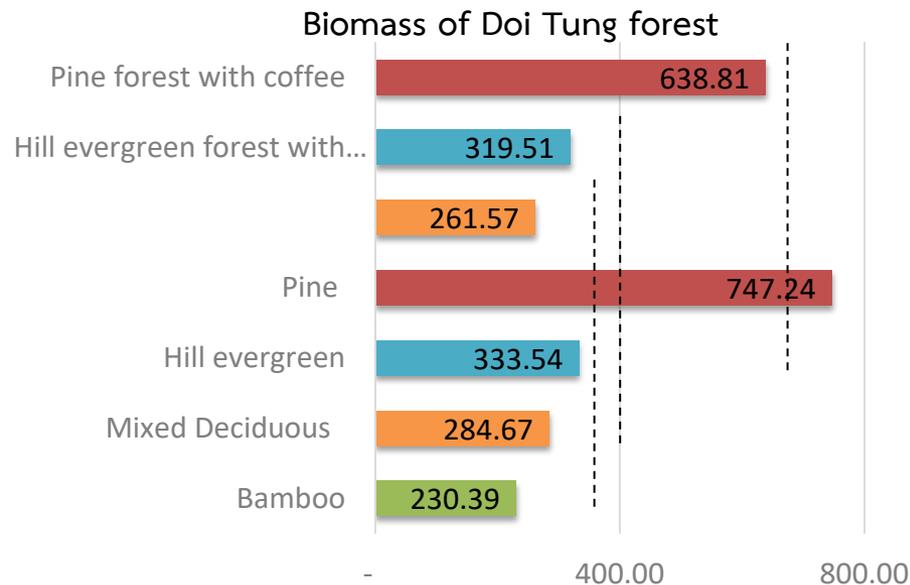
CF = 47% of total biomass for most trees

Unit : t-CO₂e

TVERs calculation for P-REDD+

7 types of forest / 15 stratum / 45 sampling plots

Types of forest	Elevation (m)	Area (ha)	Biomass (ton/ha)	Biomass (t-CO ₂ eq/ha)	Biomass (t-CO ₂ eq)
Bamboo	410-899	3,851	109.35	188.44	725,691
	900-1410	539	158.03	272.33	146,973
Mixed Deciduous	400-799	2,305	150.82	259.91	599,244
	800-1000	372	179.55	309.42	115,304
Hill evergreen	600-1199	1,181	147.29	253.84	299,810
	1200-1440	107	239.79	413.25	44,432
Pine	550-899	705	269.84	465.03	328,199
	900-1199	833	505.38	870.93	725,591
	1200-1509	222	525.58	905.75	201,149
Mixed Deciduous with coffee	400-1000	190	151.78	261.57	49,844
Hill evergreen with coffee	600-1199	272	169.69	292.42	79,633
	1200-1440	103	201.12	346.61	35,881
Pine with coffee	550-899	71	385.71	664.71	47,753
	900-1199	105	291.40	502.19	53,031
	1200-1509	64	434.93	749.53	48,090
Total		10,926			3,500,624



Carbon sequestered: 320 t-CO₂eq/ha

Expect to prevent loss of forest area (REDD):

131 ha/yr. (41,912 t-CO₂eq/yr)

Expect to sequester more (+):

64,876 t-CO₂eq/yr.*

Expect to gain TVERs annually for 20 yrs.:

106,788 t-CO₂eq/yr

(Valued €562,000/yr. or €51/ha/yr)

*Default value 5.9375 t-CO₂eq/ha/yr.



Benefits from buying carbon credits from forestry projects

- **Lots of Co-benefits:** increase income and better the livelihood of the community living in the forest / Establishment of local Social Enterprises or cooperation / PES
- **CSR:** money from a company to be used sustainably not just giving it for free
- **Carbon offsetting:** Carbon Neutral Event / Carbon Neutral Man / Carbon Neutral Org.
- **Sustainable reporting:** Annual report especially for company in SET / DJSI / Carbon Disclosure Project
- **No Tax on selling carbon credit**
- **Priced around €1-4** per 1 TVERs a few companies in Thailand has already purchased
 - Paragon department store 3,000 TVERs price €1/t-CO₂e (Biomass energy Mitphol)
 - Chiang Mai univ. 566 TVERs price €4/t-CO₂e (Biogas from pig farm)
 - SET 2,403 TVERs price €4/t-CO₂e (Hydropower from EGAT)



Thank you

