Certificate

This is to certify that

AFLIZAR

has participated as an **Oral Presenter**

t the 2015 International Conference on Green Development in Tropical Regions
Held on the 28 - 31 October 2015, Andalas Uniiversity, Padang-Indonesia

Rudi Febriamansyah, M.Sc.
f the IC-GDTR 2015

Prof. Dr. Syafruddin Karimi, SE., M.A
Directtor of Graduate Program Andalas Universit

Press ? for keyboard shortcuts.

Re: Conference Information (2)

greendev@pasca.unand.ac.id Dear Aflizar Melafu, Re: 2015 International Conference on Green Development in Tropical Regions, Padang there is we attach fee registration for conference, one day tour, and short course. Kind Regards
Oct 6 at 12:14 PM
greendev@pasca.unand.ac.id
To
aflizar_melafu@yahoo.com
CC
maria140379@gmail.com
Today at 4:36 PM
Dear Participants,

Thank you for sending us the full paper and your payment. We will get back to you later and send the conference program on 14th October 2015.

Kind regards,
Organizing Committee

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> AssessmentErosion 3D Hazard with USLE and Surfer Tool in Pasaman Watershed, SumatraIsland-Indonesia

Aflizar1),Roni Afrizal, Edi Syafri and Muzakkir

1)PoliteknikPertanian Negeri Payakumbuh/ State Polytechnic Payakumbuh for Agriculture,Payakumbuh 26271, Indonesia. Fax :62-752-7750220, e-mail: aflizar_melafu@yahoo.com

Abstract for GreenDevelopment in Tropical Regions. Padang and Bukikttinggi, october
> 20-31, 2015

Â Quantificationof soil erosion rate is animportant basic to
> investigate andimprove land use system in Indonesia which has not been
> sufficiently conducted.In this study, we have tried to clarify spatial
> distribution of 3D soil erosion and dominanterosion factor controlling
> loss or redistribution of soil sediment in order toefficiently discuss the
> sustainable management of Pasaman Â watershed where is a main palmoil
> plantation Â producing area in Sumatra Island. The Universal Soil Loss
> Equation (USLE) and Erosion ThreeDimension (E3D) in Surfer tool were used
> to identify characteristic of dominantfactor in Pasaman Watershed using
> data soil survey and watershedcharacteristic. Soil erosion in Pasaman
> watershed is affected bytopography (LS) factor and soil erodibility (K)
> factor in long-term period. Atpresent, erosion is accelerated by change in
> cover crop (C) factor, soilconservation practices (P) factor and high
> rainfall erosivity (R). Estimatedsoil erosion rate was generally higher in
> upper than in lower topographicalpositions. It possibly enhanced the
> redistribution of soil, especially finesoil particles, and might
> contribute to degratedwater quality atÂ river and sea water Â as outlet
> of Â Pasaman watershed. Annual average soil erosion for Pasaman watershed
> was 427.23ton/ha/y in 2014 where exceed tolerable erosion 35,47 ton/ha/y.
> Averageconcentrations of PO4-P dan NO3-N in sea water in the outlet of
> PasamanWatershed ranged from 0.17-1.88 mg/L dan 0-2.90.mg/L from 2014,
> respectively.PO4-P exceded level standar by Indonesia. Natural factor,
> including heavyrainfall, local soil properties and land use change in a
> landscape susceptibleto soil erosion were the fundamental factor
> responsible for the high soilerosion in the watershed. The USLE model in
> Surfer was used to identifyspecific region susceptible to soil erosion by
> water and was also applied toidentify suitable sites to conduct soil
> conservation and agroecological landuse planning in Pasaman watershed.
> Â Key words: Erosion3D, Pasaman watershed, Palm Oil Plantation, USLE
>
>

greendev@pasca.unand.ac.id
To
aflizar_melafu@yahoo.com
Aug 23 at 12:24 AM

Dear Aflizar

Re: 2015 International Conference on Green Development in Tropical Regions, Padang

Your paper: Assessment Erosion 3D Hazard with USLE and Surfer Tool in Pasaman Watershed, Sumatera Island-Indonesia

Thank you for submitting an abstract for 2015-ICGDTR conference. We have had a good response to our call for submissions, with 65 abstracts submitted.

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Yours sincerely

Hasnah

Organising Committee

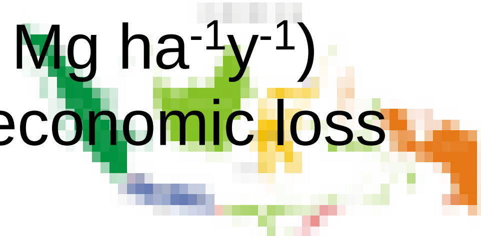
Assessment Erosion 3D Hazard with USLE and Surfer Tool in Pasaman Watershed, Sumatra Island-Indonesia

Presentation of Aflizar, Roni Afrizal, Edi Syafri, Muzakkir

Politeknik Pertanian Negeri Payakumbuh, 26271-Sumbar
State Polytechnic Payakumbuh for agriculture

2005 International Conference on "Green Development in Tropical regions"
Padang (Indonesia), October 28-31, 20015

Introduction

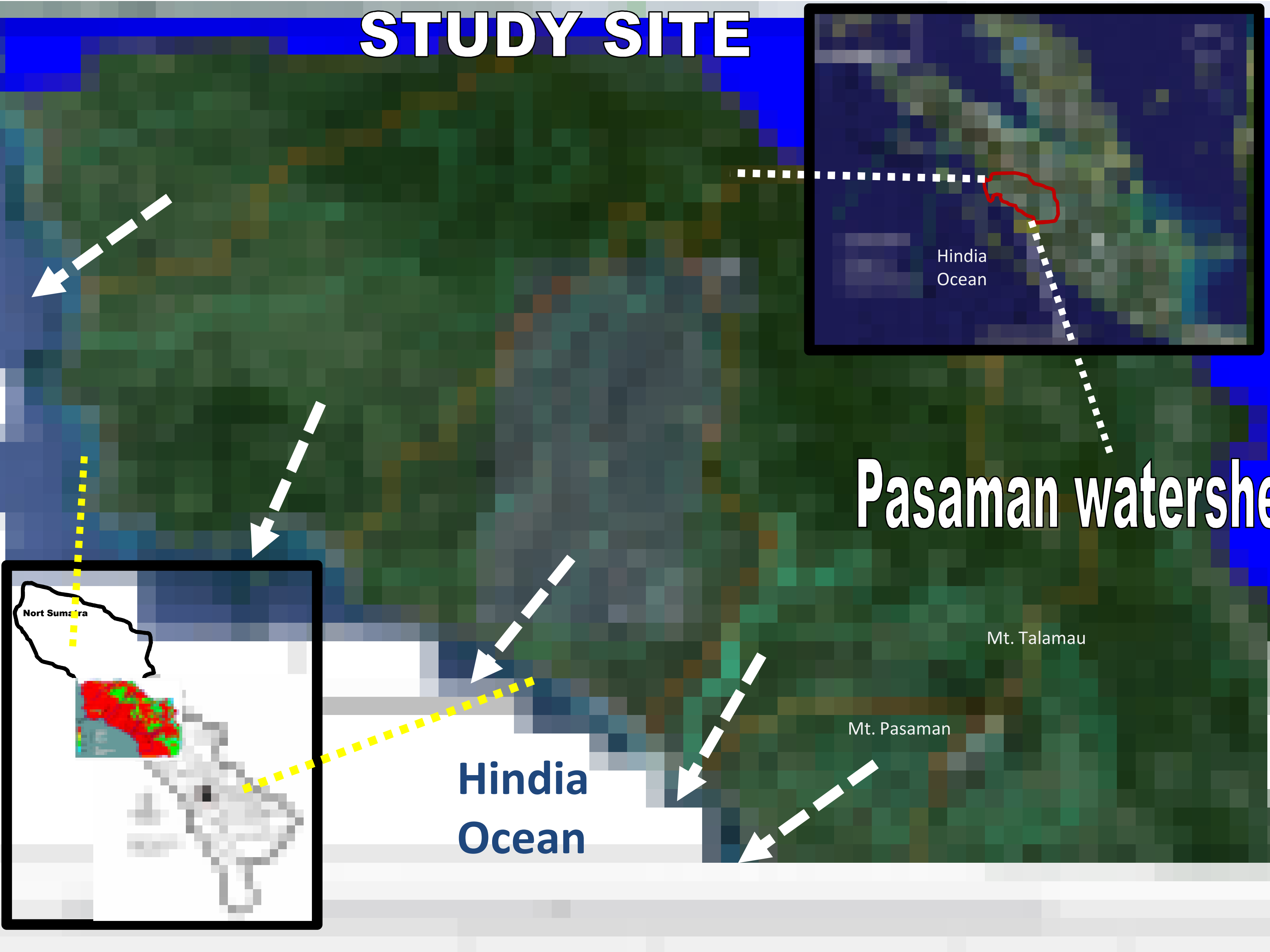


- Rate of erosion in Pasaman Watershed (? Mg ha^{-1}y^{-1})
  In Java island [6-12 Mgha^{-1}y^{-1}]→ resulting economic loss US$340-406 million (world bank 1994)
- Pasaman Watershed is Suffered from erosion due to:

Rainfall>2000 mm Change forest to Palm oil Plantation	a.Tolerable erosion rate (TER) 10-14 Mg ha^{-1}y^{-1} by Indonesia government b.TER by Hammer formula 37 Mg ha^{-1}y^{-1}

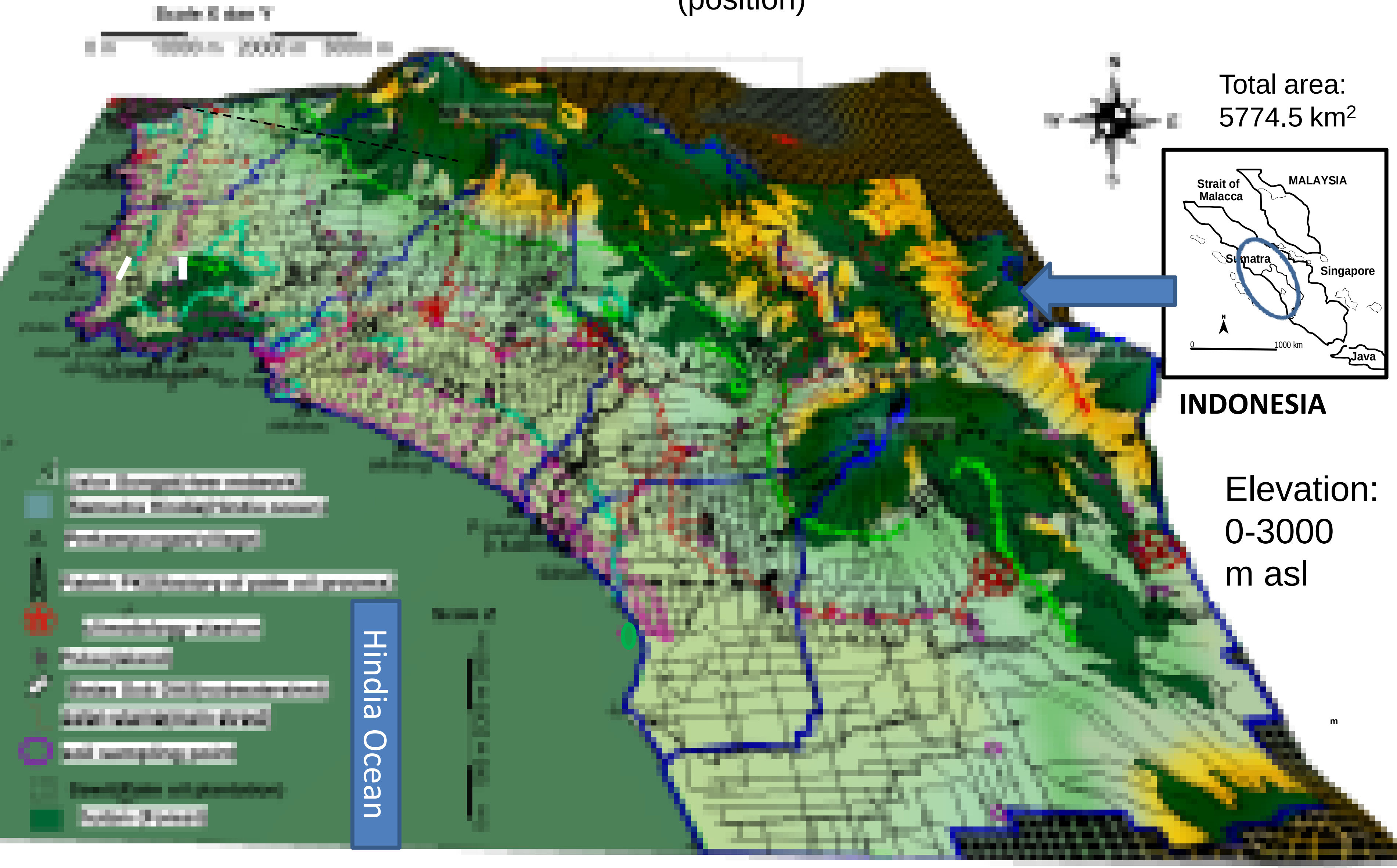
- Problem caused by erosion: - Declining soil fertility
  - Declining Crop productivity
  - Declining River & Sea quality
- To reduce erosion, We discuss :
  → Characterization of Soil Erosion Status
  → Suitable conservation method for agriculture sustainability

STUDY SITE



Hindia
Ocean
Pasaman watershe
Nort Suma ra
Mt. Talamau
Mt. Pasaman
Hindia
Ocean

(WGS 84, UTM 47M, x=503935, y=76509 WGS 84, UTM 47N, x=617409, y=9991536) (position)



Total area: 5774.5 km^2

INDONESIA

Elevation: 0-3000 m asl

Study site and distribution of soil sampling points

Methodology

- Soil Samples → 121 sites
- Soil Analyses → SOM (Walkley and Black), Texture (Pipette), Permeability (De boot), Structure (Visual)
- Other Data
  - Monthly rainfall (Meteorology station)
  - Land cover map (Landsat TM 2012)
  - Topography map (SRI)
  - Geology Map
  - Soil Type
  - Effective Soil Depth
  - Bulk density
  - Soil time Life
  - TER analyzed by Hammer method

Water Sample

River and Sea

PO4-P analyses

NO3-N analyses

$$TER = \frac{De \times Fd \times BI \times 100}{T}$$

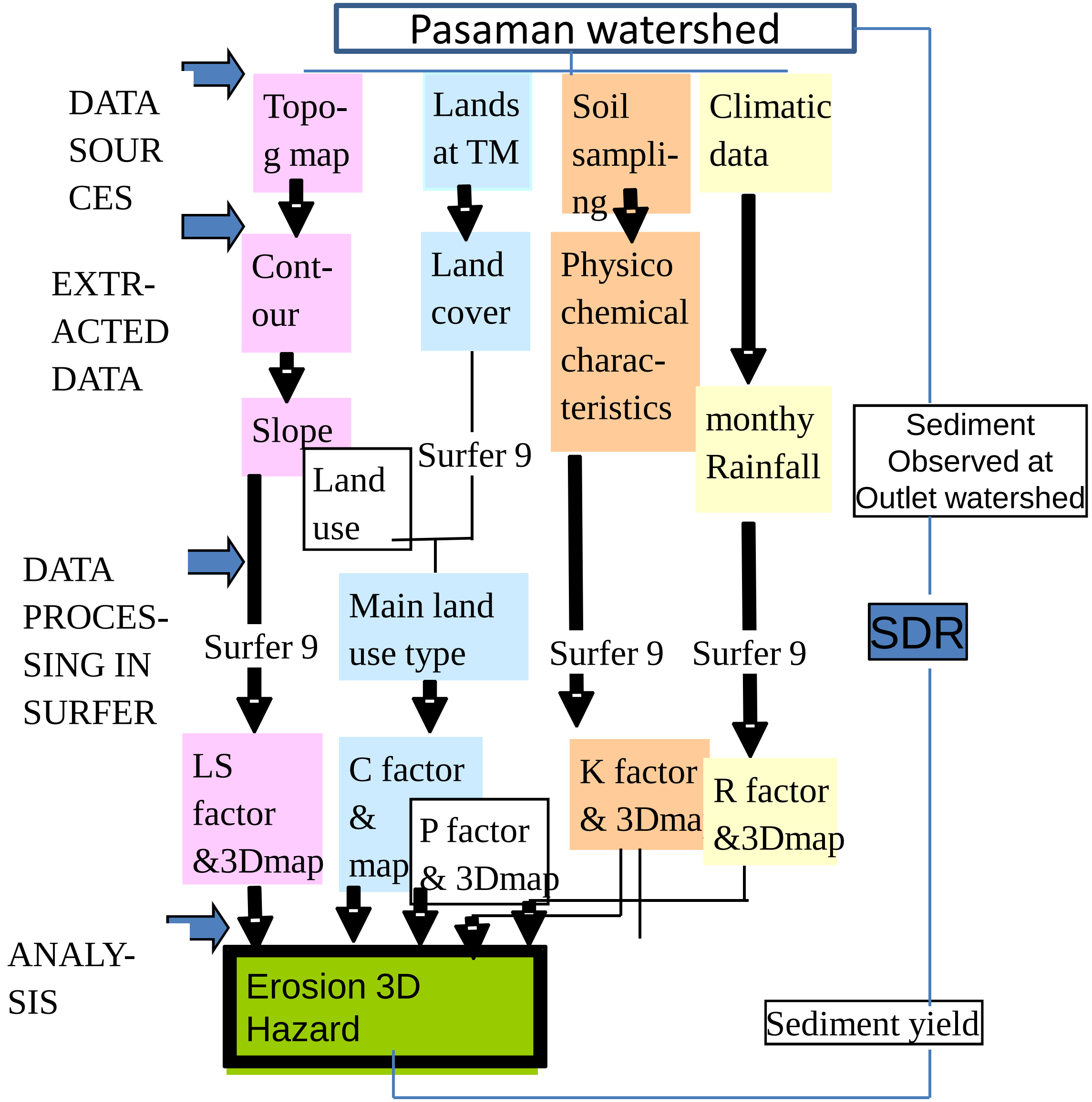
Universal Soil Loss Equation (USLE)

Erosion= R*K*LS*C*P

(Wischmeier and Smith 1978)

3D Map by Surfer 9 software

USLE, Erosion= R*K*LS*C*P



R = rainfall erosivity factor
R Factor = 6.19(*Rf*)1.21(*Rn*)-0.47 (*Rm*)0.53 *Bols (1978)* (mm ha-1y-1)

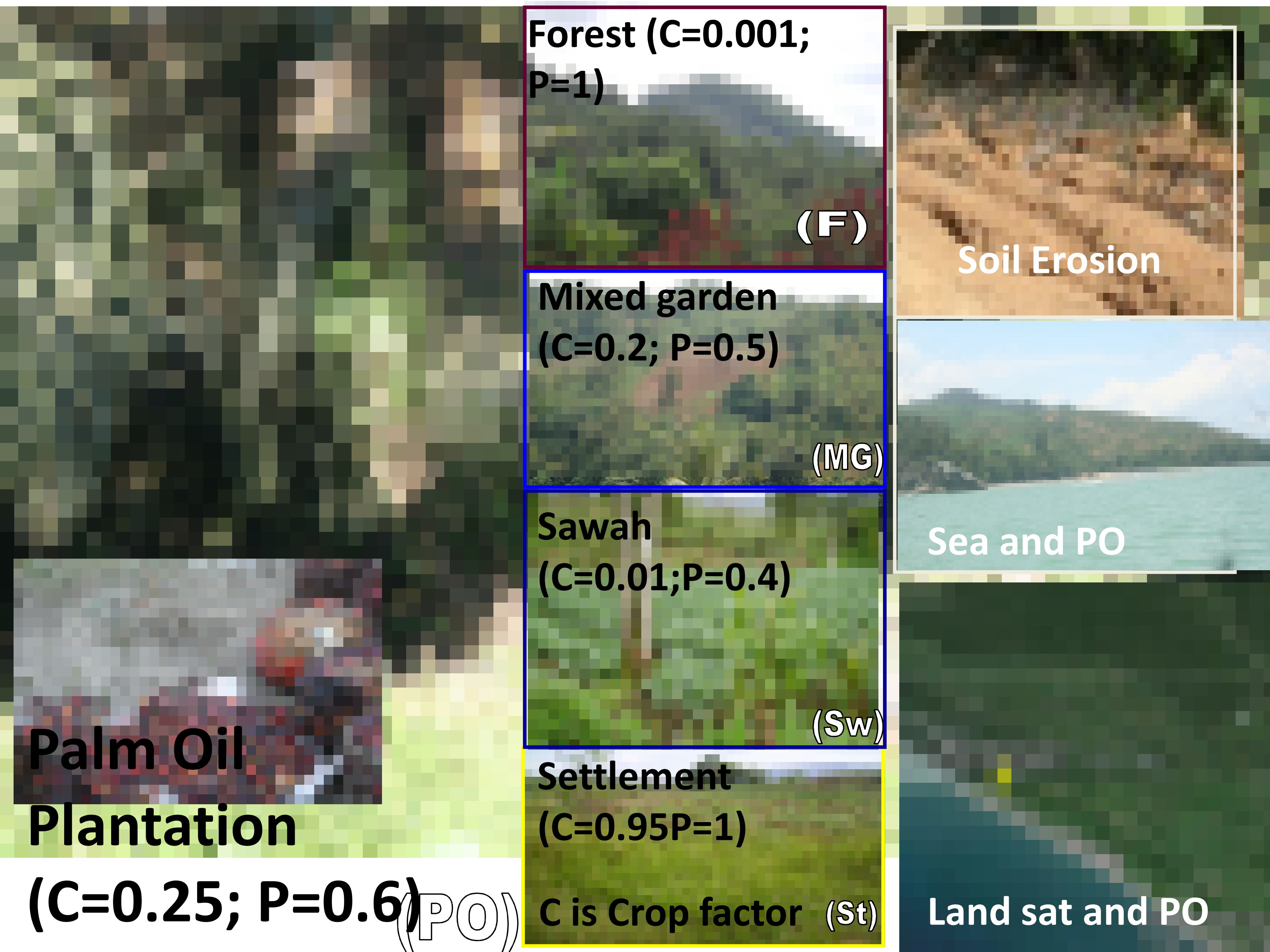
K = Soil erodibility (Mg ha h^{-1} mm^{-1})
K factor 100*K*= 2.713*M*1.14(10-4)(12-a)+3.25(b-2)+2.5(c-3) *(Wischmeier and Smith, 1978)*

LS = Slope length and steepness factor
LS Factor *Renard et al. 1994*
slope< 20%
LS = (*l*/22)*m* .(65.41. sin *2* X – 4.56. sin X + 0.065)
slope > 20%
LS = (*l*/22)*0.7* .(6.432. sin (X*0.79*).cos (X))

C = *Cover and management factor*
P = Soil conservation practices Factor
Suggested by Table of Morgon (1978) and Abdurachman(1984)

The grid-cell were set 500 m by 500 m
Total grid : 129712 grid cell

Data sources and data extraction and processing


Forest (C=0.001; P=1)
(F)
Mixed garden (C=0.2; P=0.5)
(MG)
Sawah (C=0.01;P=0.4)
(Sw)
Settlement (C=0.95P=1)
C is Crop factor
(St)
Palm Oil Plantation (C=0.25; P=0.6)
(PO)
Soil Erosion
Sea and PO
Land sat and PO

Result General Soil Physico-Chemical properties

n=121	Mean	Max	Min	SD
Sand (%)	15.8	70	1	11.4
Very fine sand(%)	14.2	30	2	9.4
Silt(%)	30.9	65	0.1	17.4
Clay (%)	36.78	90	0.1	19.8
Organic matter(%)	6.55	99	1.5	10.9
Soil Permeability(cm h^{-1})	5.08	12	0.5	4.63
Soil Permeability code	3.7	6	0.0	2.1
Soil Structure code	2.8	4	0.0	1.4
Soil Erodibility (*K*-factor)	0.20	0.50	0.0	0.1
Bulk density (g cm^{-3})	1.11	1.2	0.85	0.19

Structure code: 1 very fine granular; 3 medium-coarse granular; 4 blocky, platy, massive
Permeability code: 1 > (25.4); 2 (12.7-25.4); 3 (6.3-12.7); 6 (<0.5)

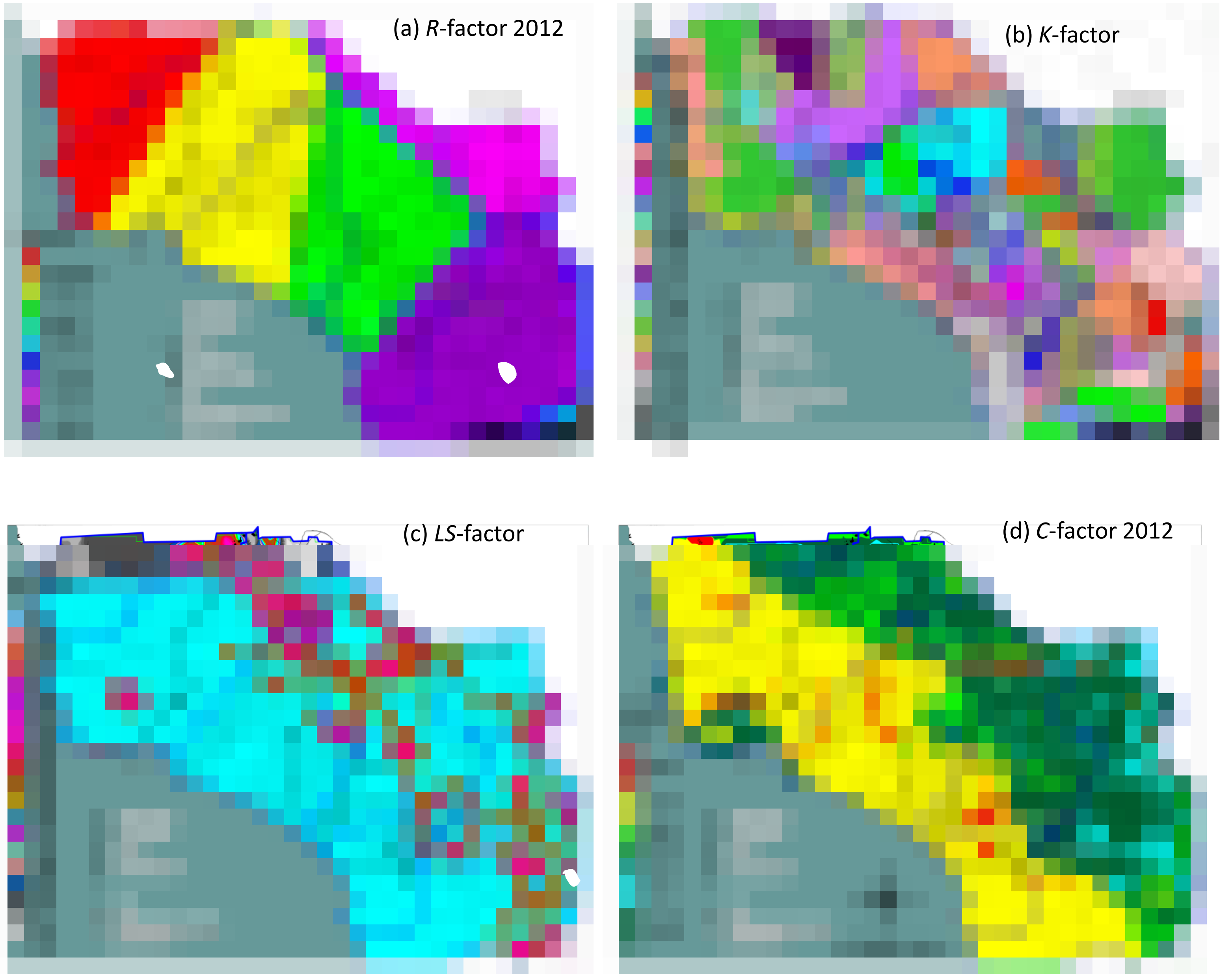
Monthly rainfall and rainfall erosivity (*R*-factor USLE) in the Pasaman watershed

Month	Monthly Rainfall(mm)	R factor (2000-2012)
January	393.5	326.84
February	612.36	801.27
March	475.64	456.25
April	579.93	636.21
May	312.43	270.97
June	407.43	473.68
July	324.00	676.99
August	385.00	409.86
September	419.30	429.36
October	532.64	594.31
November	620.90	1108.35
December	659.31	894.37

7 Rainfall station

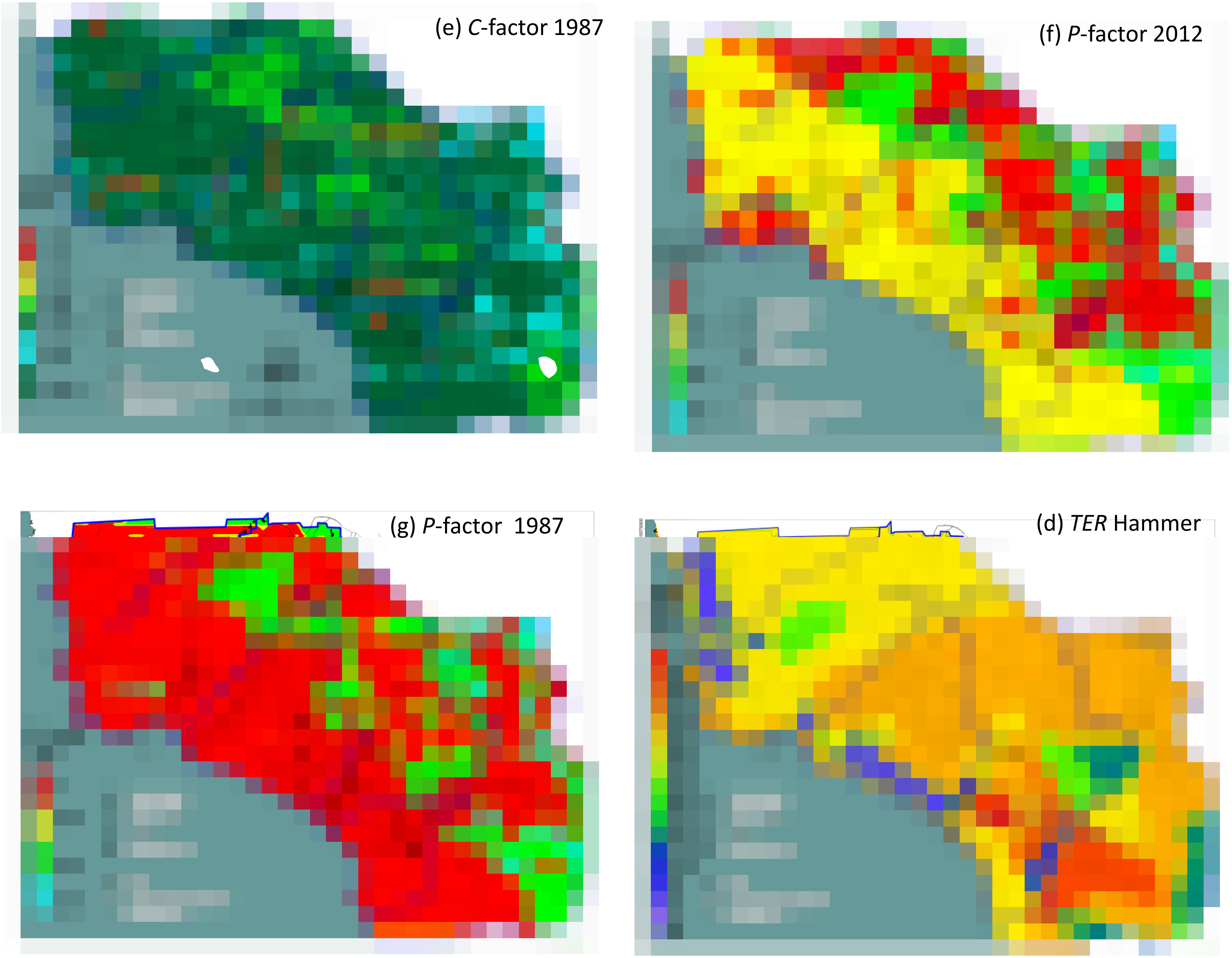
1. Mandailaing Natal
2. Ujung Gading
3. Tigo Nagari
4. Simpng Tigo
5. Bonjol
6. Rao
7. Maninjau

R = rainfall erosivity factor : $R = 6.19(Rf)^{1.21}(Rn)^{-0.47}(Rm)^{0.53}$ (*Bols ,1978)*



R : Rainfall Erosivity, K: Soil erodibility, LS : Topography, C: Crop, P: Conservation

Spatial distribution map of each factor controlling soil erosion

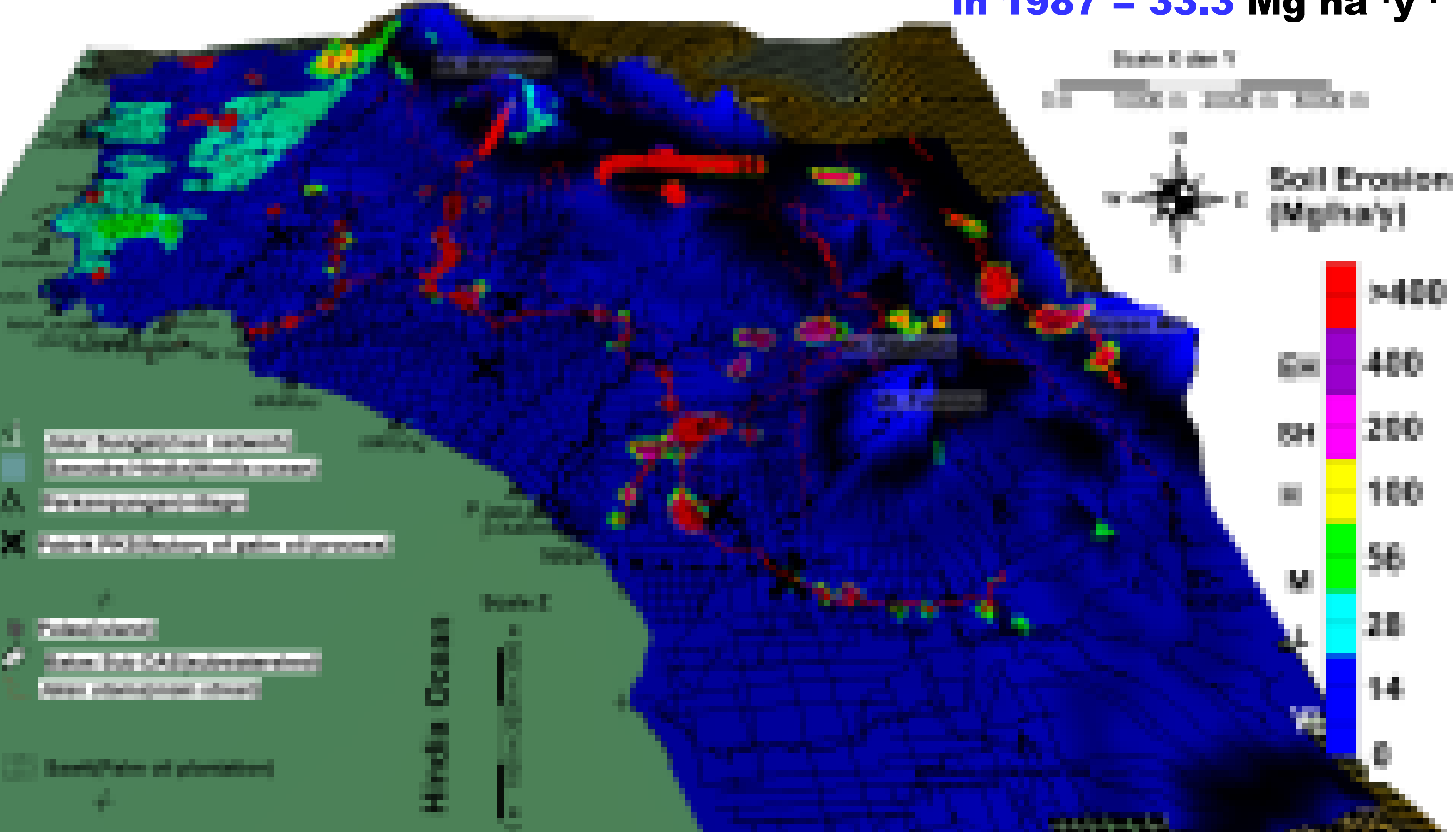


C: Crop, P: Conservation, TER: Tolerable erosion

Spatial distribution map of each factor controlling soil erosion and TER

Soil erosion in 1987

Average erosion in 1987 = 33.3 Mg ha^{-1}y^{-1}

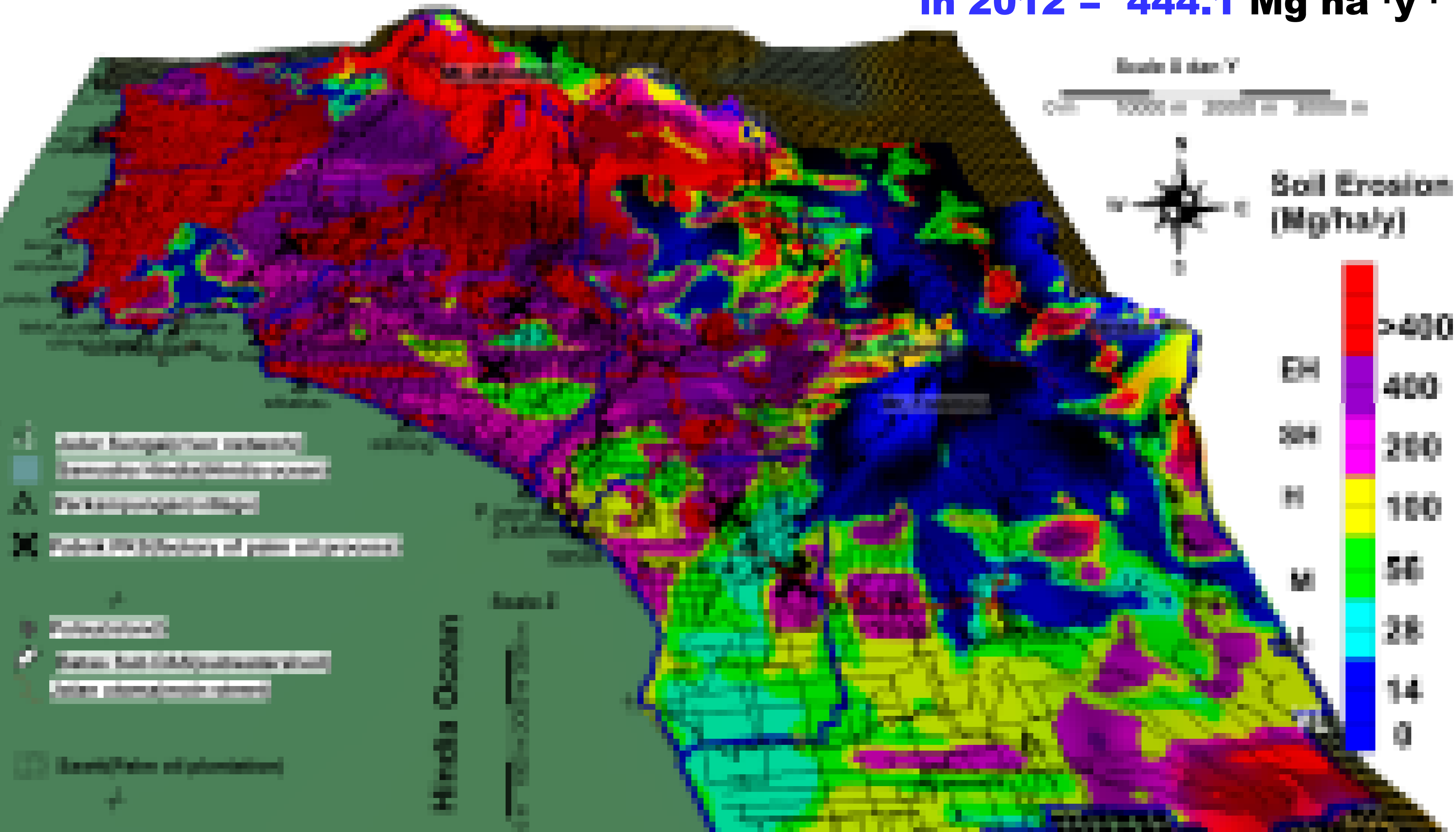


(TER): 35,47 Mg ha^{-1}y^{-1}

Soil erosion rate in 1987 at Pasaman Watershed

Soil erosion in 2012

Average erosion in 2012 = 444.1 Mg $ha^{-1}y^{-1}$



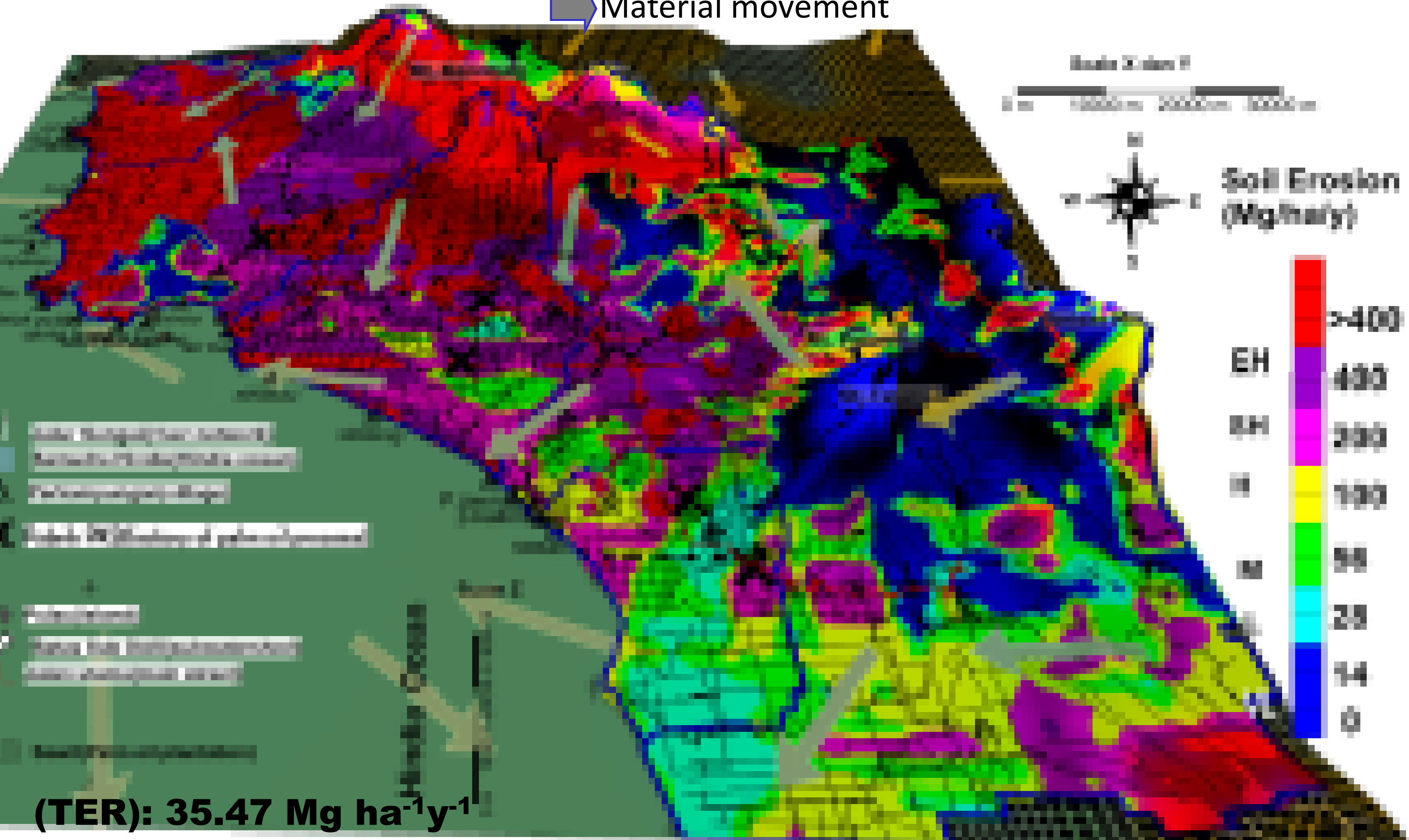
(TER): 35.47 Mg $ha^{-1}y^{-1}$

Soil erosion rate in 2012 at Pasaman Watershed

Soil erosion in 2012

Average erosion in 2012 = 444.1 Mg $ha^{-1}y^{-1}$

Material movement



(TER): 35.47 Mg $ha^{-1}y^{-1}$

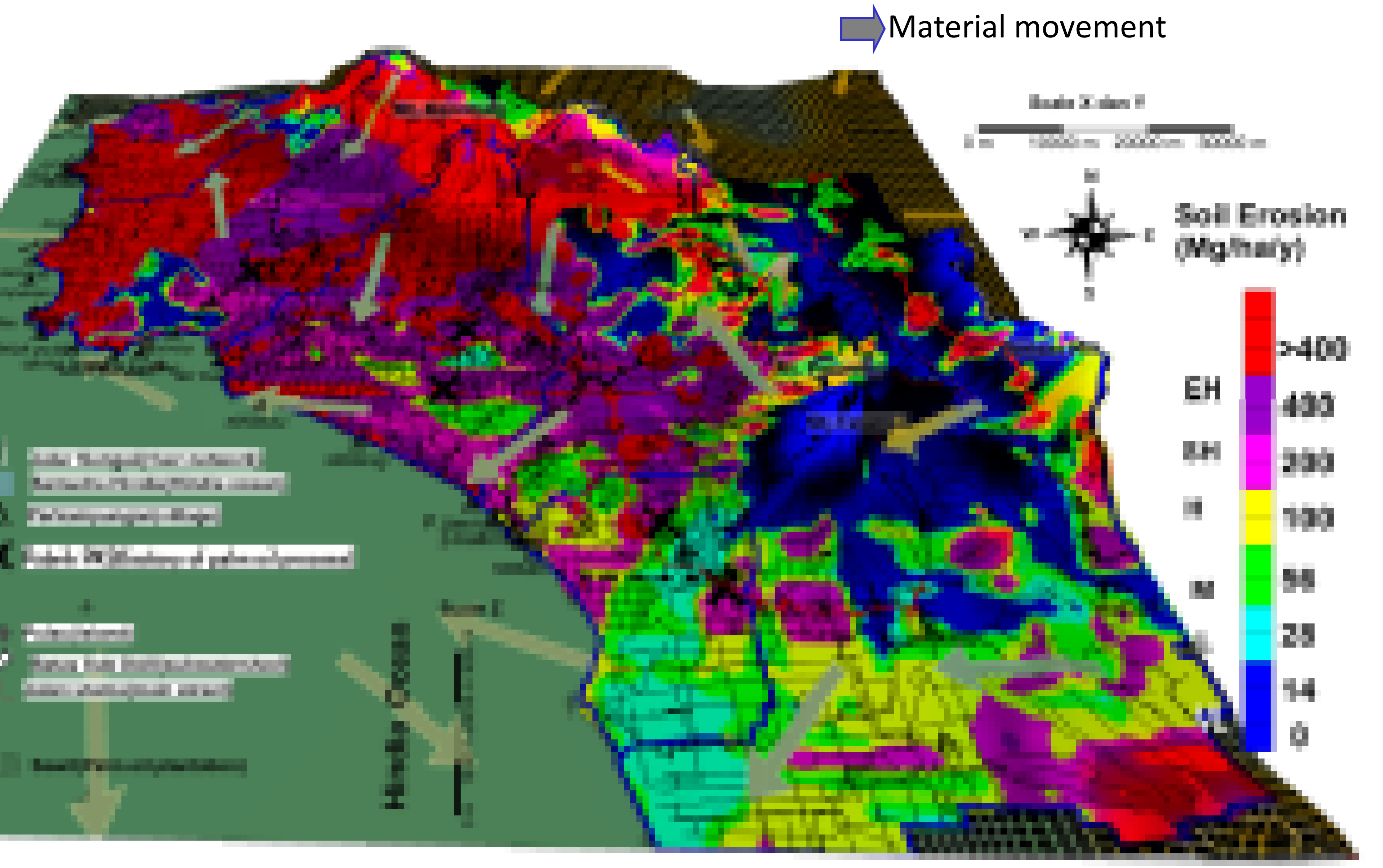
Soil erosion rate in 2012 at Pasaman Watershed

SDR and Estimated sediment yields in Pasaman Watershed

Location	Soil erosion rate (Mg $ha^{-1}y^{-1}$)	Study area (km^2)	Measured sediment yield (Mg $ha^{-1}y^{-1}$)	Estimated Sediment yield (Mg $ha^{-1}y^{-1}$)	SDR (%)
Pasaman Watershed 2012	444.1	5774.5		26.46 152,790.3 Gg y^{-1}	5.96
Sumani Watershed in 2011	76.70	583		9.33	12.7
Malaysia in 2005[a]					
B. Teh (0.37)	93.76	30.27	10.87		12
B. Cempedak (0.37)	152.72	31.74	18.13		12
Kuala Tasek (0.37)	123.19	63.09	14.50		12
France in 2001[b]					
Lautaret (0.03)	28.34	12.92	0.87		30
Belgium in 2001[b] Hangeland (0.24)	11.14	12.92	7.29		65
Portugal in 1990[b]					
Amedoria (0.15)	20.52	10.75	2.89		14
Greece in 1993b					
Lagadas (0.13)	12.65	0.24	6.93		55

Number in parentheses indicate of *C*-factor, [a] Shamsad et al. 2008, [b] Bakker et al. 2008, SDR: Sediment Delivery Ratio

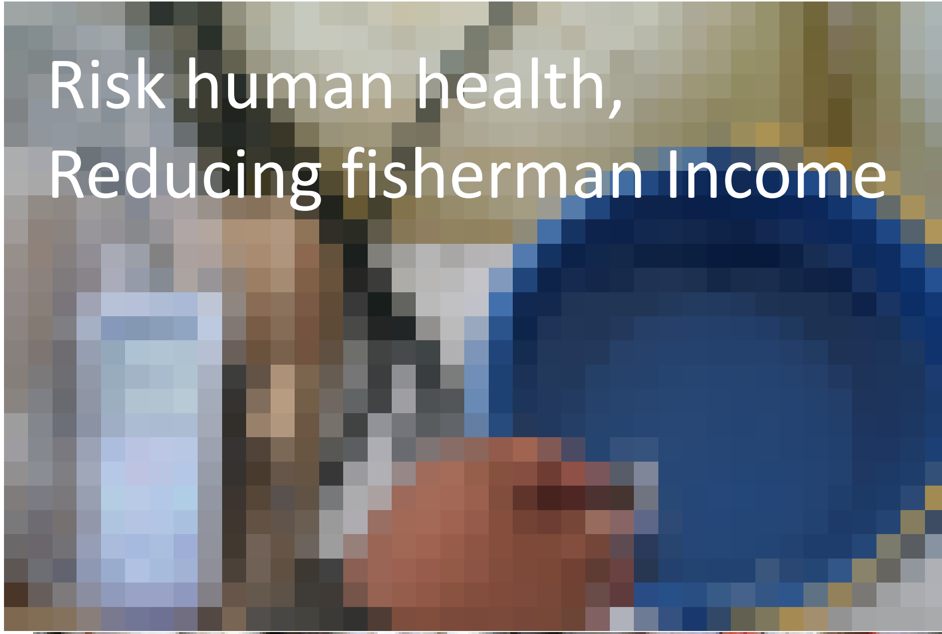
Distribution of Soil erosion product



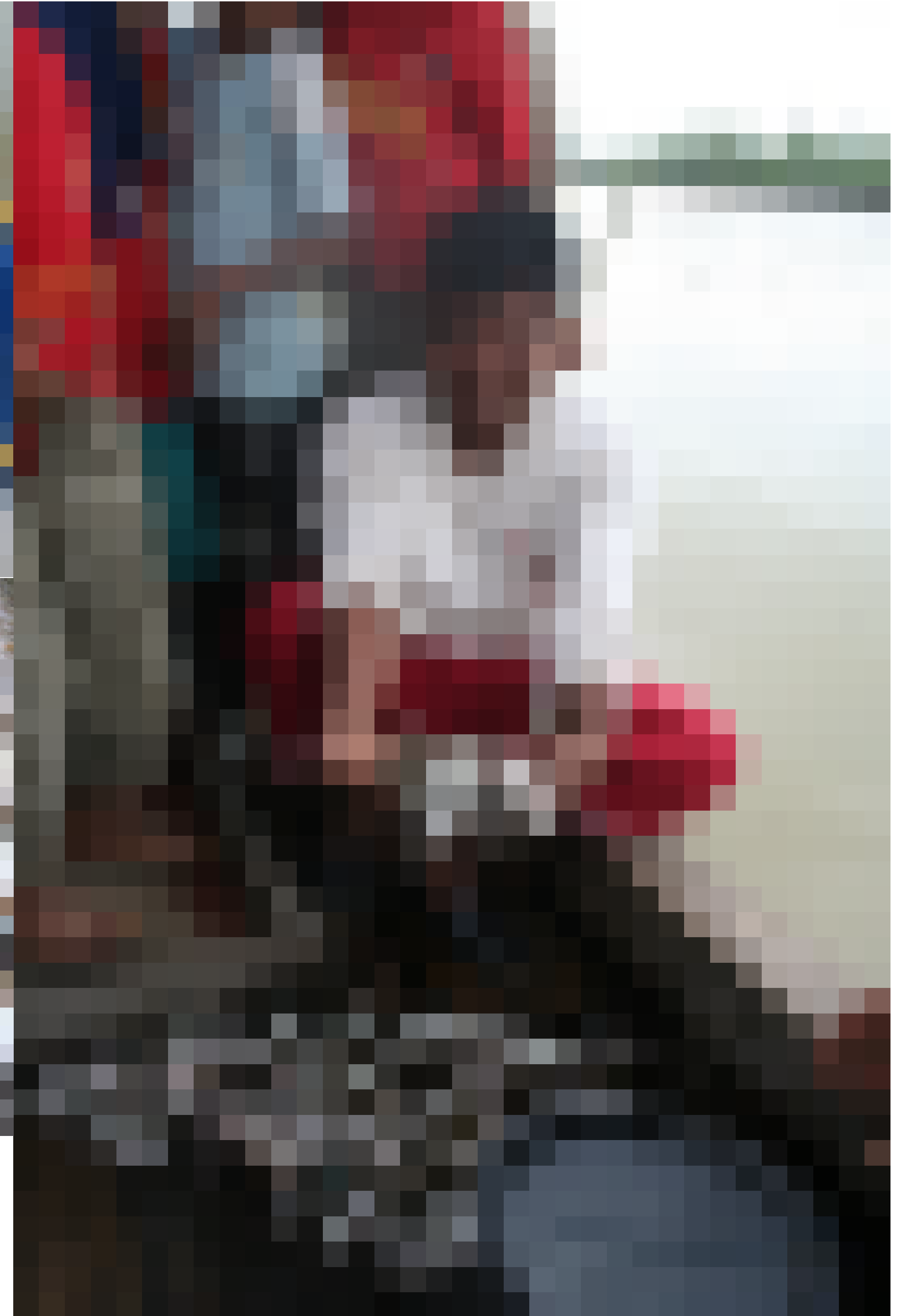
Concentration of PO4-P and NO3-N in river and sea water in Pasaman watershed in 2014

Concentration(ppm)	River water (n=3)		Sea water (n=48)	
	PO4-P	NO3-N	PO4-P	NO3-N
Mean	0.63	0.2	0.34	0.12
Min.	0.17	0	0.05	0
Max.	1.83	0.40	1.88	2.90
SD	0.80	0.23	0.33	0.57
Limitation*	0.05	1.1	0.05	1.1

*(Daniel et al. 1998) and Indonesia government standard

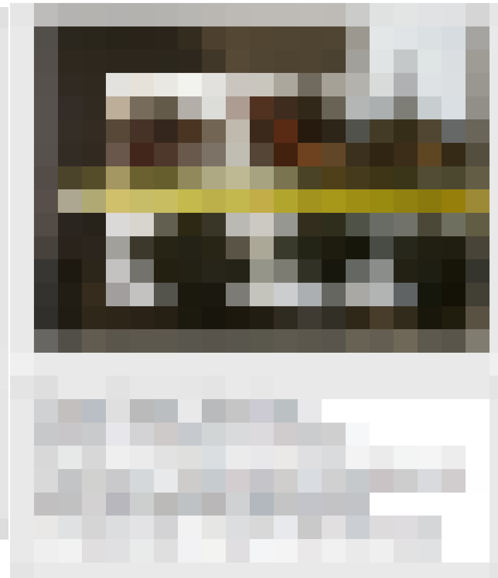
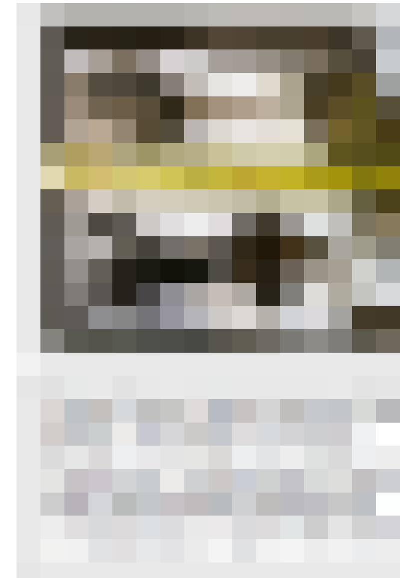
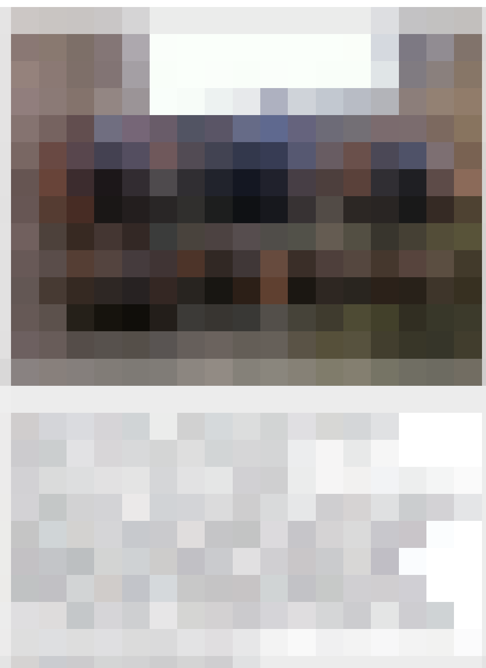
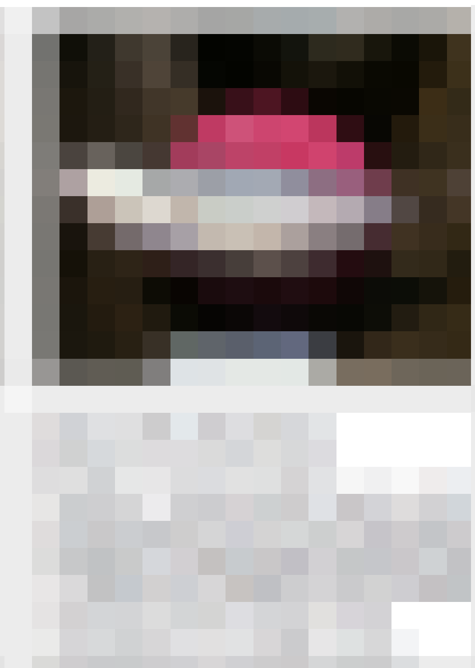
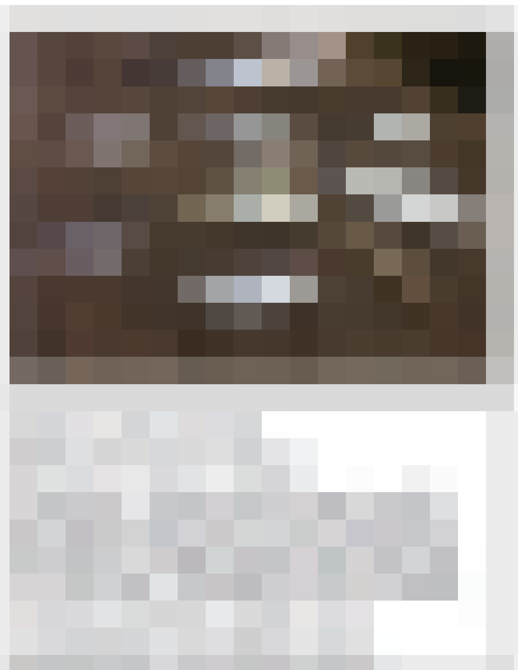
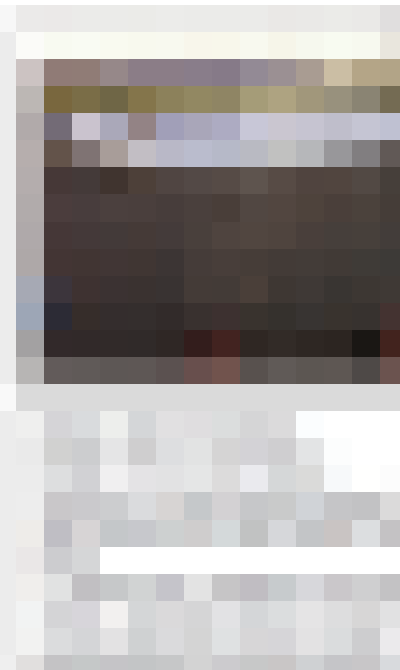


8 July 2011; Time 10:50. Huge fish death in river water



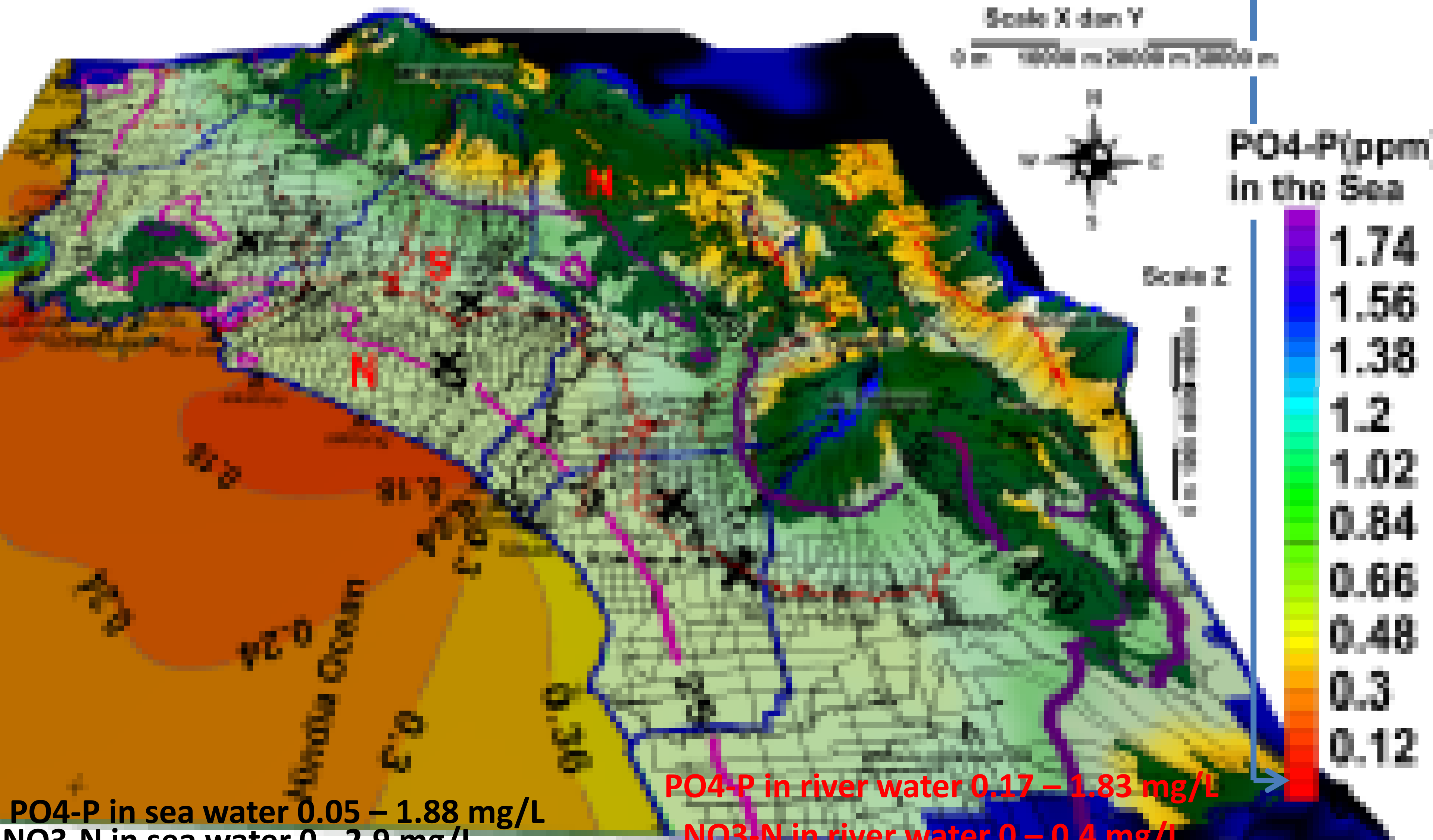
Declining Biodiversity and population sea life



T-P = 0.05 ppm to control Eutrophication(Daniel et al.1998)

PO4-P=0.01 for tourism and sea life



PO4-P in sea water 0.05 – 1.88 mg/L
NO3-N in sea water 0 - 2.9 mg/L

PO4-P in river water 0.17 – 1.83 mg/L
NO3-N in river water 0 – 0.4 mg/L

Distribution of PO4-P in sea water as outlet Pasaman watershed

Summary

1. Average soil erosion value 444.1 Mg $ha^{-1}y^{-1}$ (extreme high erosion class, Odura 1996, Irvem et al 2007) because lack of proper soil management and change natural forest to palm oil plantation
2. Soil erosion results in watershed degradation, including both soil and water resources.PO4-P contamination in Sea and river water can be explained by soil erosion, may lead to river and sea eutrophication.
3. The Pasaman watershed sustains human life and is a viable, functioning ecosystem. Soil erosion is affected by C factor (change forest to palm oil plantation). Natural environmental factors affecting erosion such as rainfall(R-factor) and soil (K factor).
4. It is vital to control soil erosion in the Pasaman watershed to reduce the risks of resources and environmental degradation that are directly related to risk to human health, reduce biodiversity and fisherman income
5. To reducing the risk of soil erosion through better land use planning and management for the Pasaman watershed can be implemented.

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