ANALYZING EROSION PRONE AREAS IN POWER LINE PROJECTS

Luiz Arruda de Souza Filho

Eletrobras - Brazil

SUMMARY

- Presentation
- Case Study
  - Problem
  - Solution
- Results

Problem

The environmental licensing process for new developments are demanding and complex

Data Analysis Integrated

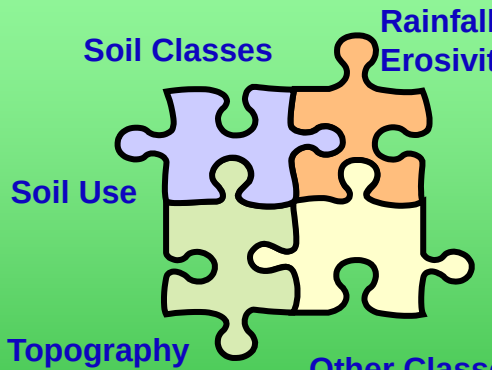
Spatial Data Analysis

Short Deadline

High Costs and Low Income

GIS enables spatial data analysis quickly

Case - Definition



Erosion Prone Areas Map

Case Study

Anta / Simplício / Rocha Leão Power Line
Rio de Janerio and Minas Gerais State -
Ext.:158 km

USLE – Universal Solis Less Eq.

- Empirical Model by the US Natural Resources Conservation Service in the 1950s.
- Most important studies about USLE In Brazil by Bertoni and Lombardi Neto since 1970.
- Applicable in many areas, particularly in watershed management.

$$A = R \times K \times [LS] \times CP$$, were:

A = long-term average annual soil loss in t/ha/year

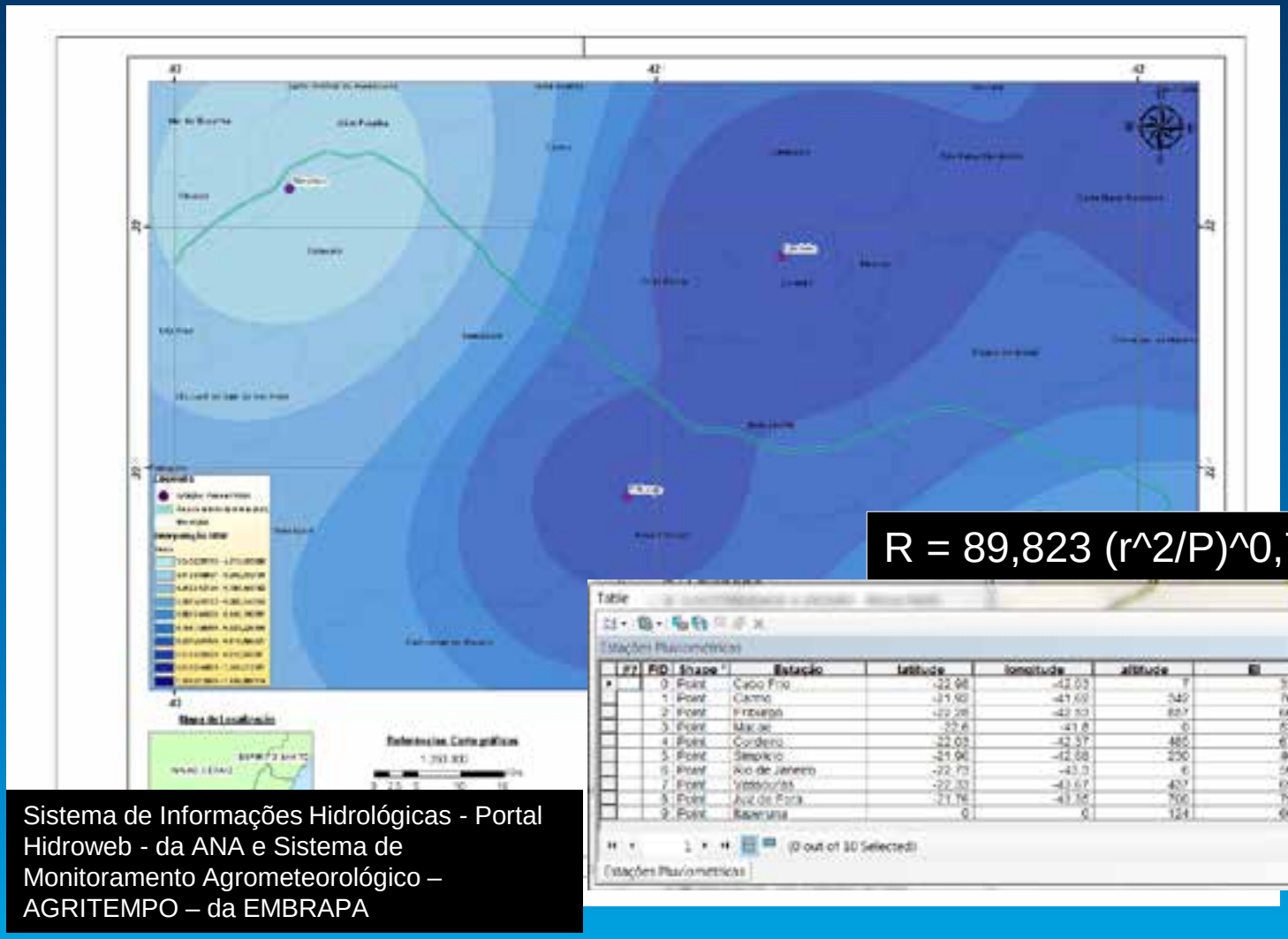
Natural factors

R = Rainfall Erosivity Factor
K = Soil Erosivitly Fatcor
LS = Topographic Factors (slope and lenght)

Anthropics Factors

CP = Cropping Manegement and Conservation Pratices Factors

Rainfall Erosivity - R



R = 89,823 (r^2/P)^0,759

Sistema de Informações Hidrológicas - Portal Hidroweb - da ANA e Sistema de Monitoramento Agrometeorológico – AGRITEMPO – da EMBRAPA

Soil Erosivity - K

Solo original	Valor K (t/h/mj.mm)	Fonte
CXbe	0,0441	Ribeiro e Alves (2007)
CXbd	0,0115	Denardin e Silva et al. (apud CECÍLIO, 2008)
LVAd	0,0200	Ribeiro e Alves (2007)
LAx	0,0150	Ribeiro e Alves (2007)
PVAd	0,0270	Marques (1996)
Rube	0,0420	Ribeiro e Alves (2007) e Freitas et al. (2007)

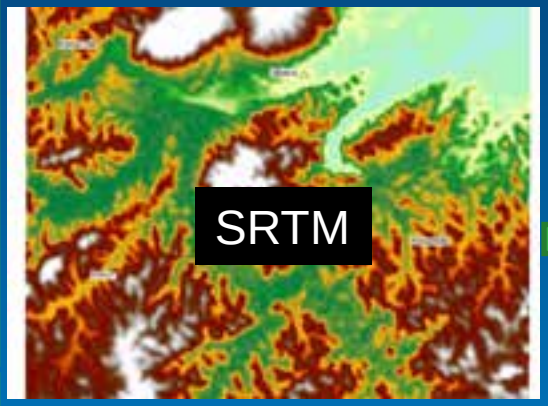
Topographic Factors - LS

LS = 0,00984C^0,63D^1,18

C – lenght
D - slopes

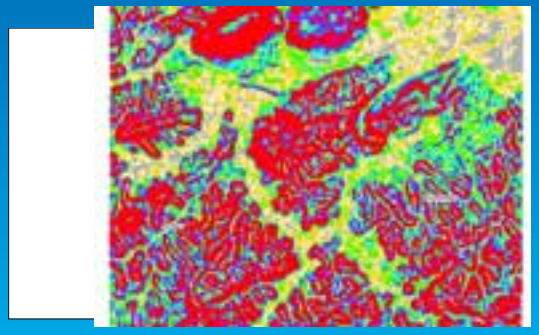
C = A/4l

A – sub basins area
l – subbasins lenghts



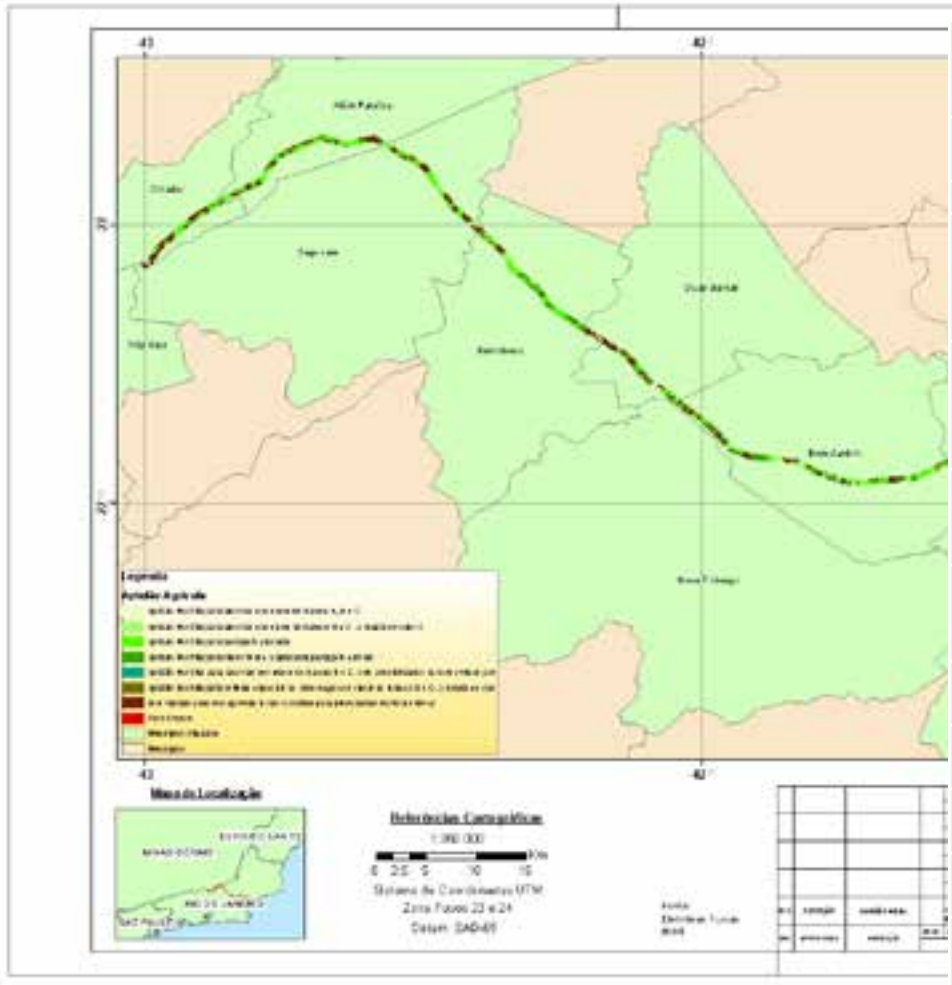
Sub basins

Resultant Map – LS Factor



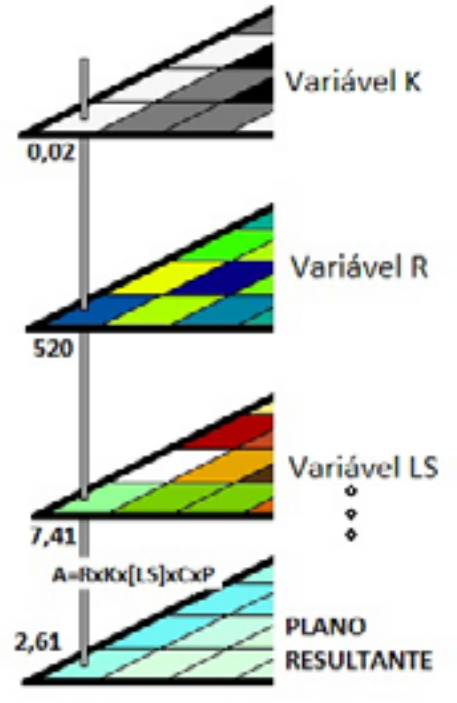
Slopes

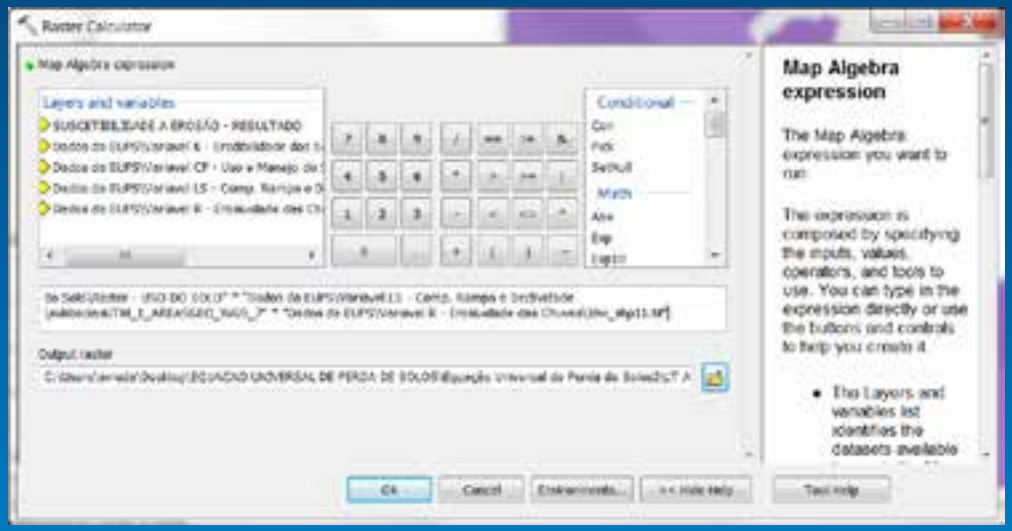
Cropping Manag. and Conservation Pratices - CP



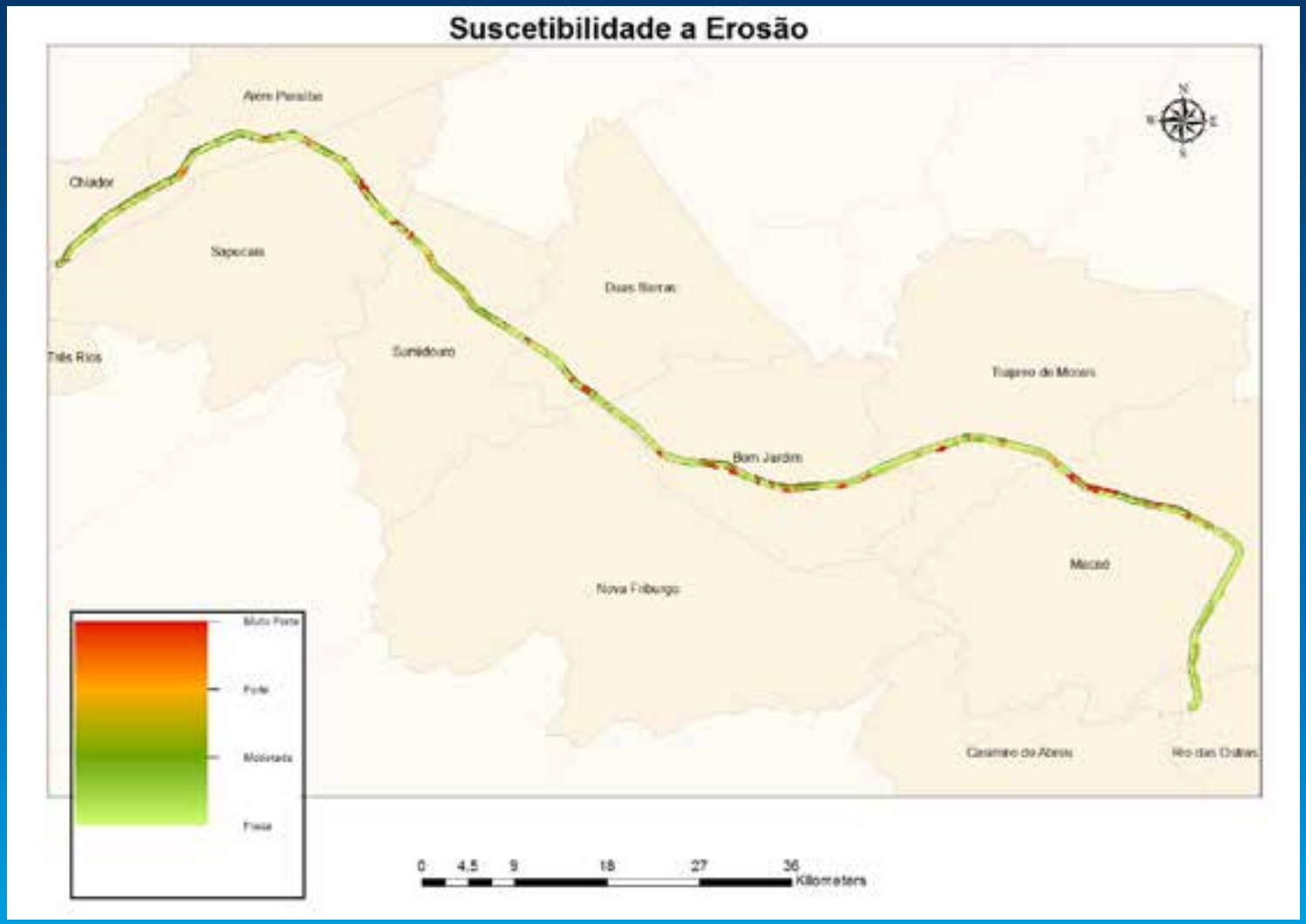
CLASSE	VALOR C	FONTE
Agricultura	0,2	Stein et al. (apud BRITO et al., 1998)
Corpos D`água	0	
Floresta Estacional Semidecidual Montana	0,012	Bertoni et al.
Floresta Estacional Semidecidual submontana	0,012	Bertoni et al.
Floresta Ombrófila Densa montana	0,012	Bertoni et al.
Floresta Ombrófila Densa submontana	0,012	Bertoni et al.
Florestamento / Reflorestamento	0,008	Fernandes (2008)
Influência Urbana	0	
Pecuária (Pastagem)	0,025	Bertoni et al.
Savana Florestada	0,042	Farinasso et al. (2006)
Vegetação Secundária Inicial	0,018	Farinasso et al. (2006)

Map Algebra

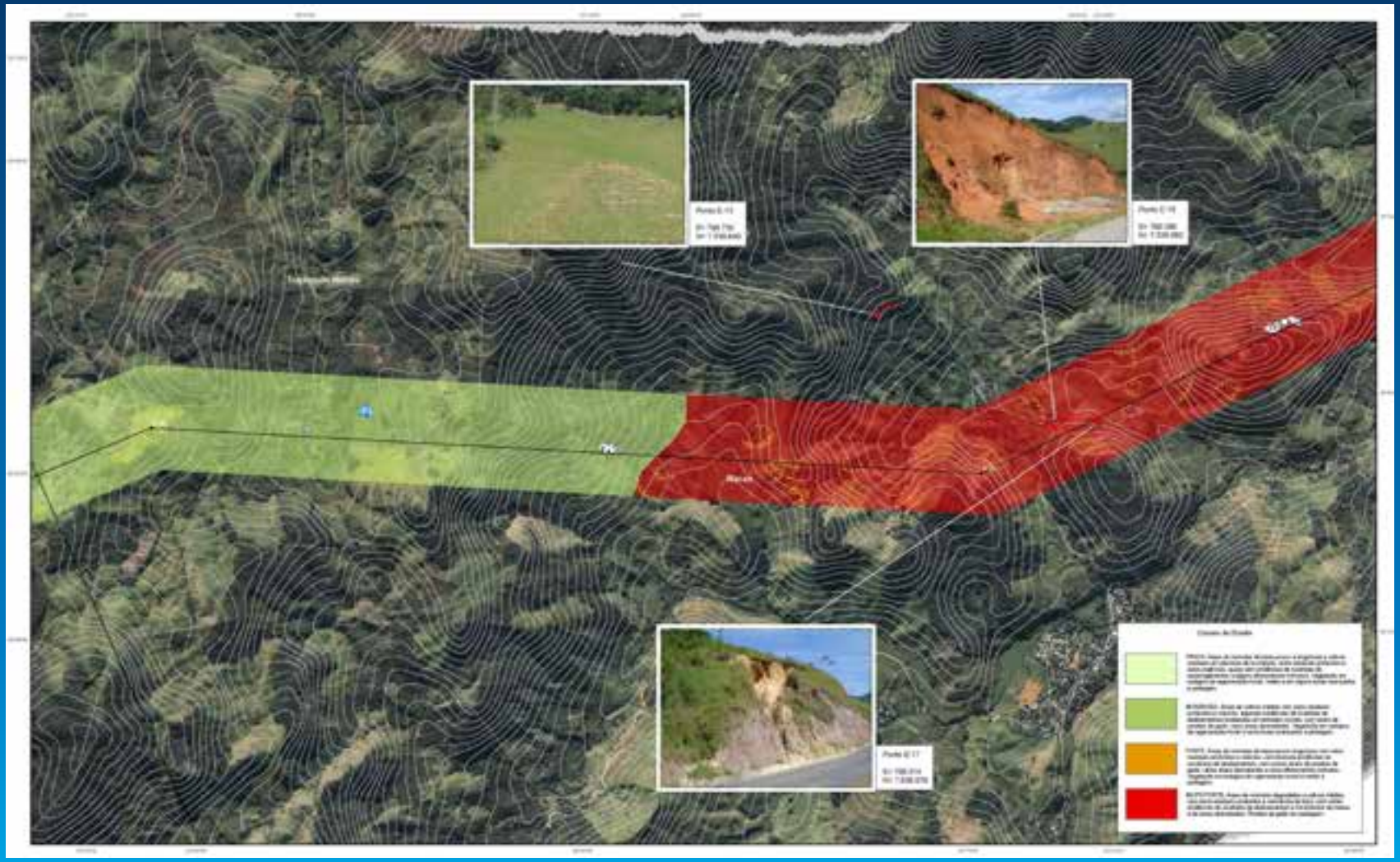

Variável K
0,02
Variável R
520
Variável LS
7,41
A=RxKx[LS]xCxP
2,61
PLANO
RESULTANTE


Raster Calculator
Map Algebra expression
Layers and variables
Conditional
Math
Output raster
OK
Cancel
Map Algebra expression
The Map Algebra expression you want to run.
The expression is composed by specifying the inputs, values, operators, and tools to use. You can type in the expression directly or use the buttons and controls to help you create it.
The Layers and variables list identifies the datasets available

Results


Suscetibilidade a Erosão
Apers Paraíba
Chiador
Sapucaia
Três Rios
Sumidouro
Duas Barras
Bom Jardim
Nova Friburgo
Macaé
Casimiro de Abreu
Rio das Ostras
Muito Forte
Forte
Moderado
Fraco
0 4,5 9 18 27 36
Kilometers

Results – Manual Extraction Example



Results – Manual Extraction Example

Results – Comparing

Thank You!
Muito Obrigado!

Luiz Arruda de Souza Filho
Cartography Engineering

ELETROBRAS BRAZIL
+55 21 2514-6083
luiz.souza-filho@eletrobras.com

www.eletrobras.com