

SER 300 – Introdução ao Geoprocessamento



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MÉTRICAS DE PAISAGEM APLICADAS À ANÁLISE DA URBANIZAÇÃO DISPERSA NO VALE DO PARAÍBA

David Guimarães Monteiro França

SEQUÊNCIA DE
TRABALHO

ROTEIRO

- CONTEXTUALIZAÇÃO DO FENÔMENO
- MATERIAIS E MÉTODOS
- RESULTADOS E DISCUSSÃO
- CONSIDERAÇÕES FINAIS

Burchell e Shad (1998; 1999) definem a dispersão como intrusão de baixa densidade de residências e outros usos não-residenciais na zona rural e áreas não desenvolvidas, constituindo-se em uma modalidade de consumo da terra de forma espraçada.

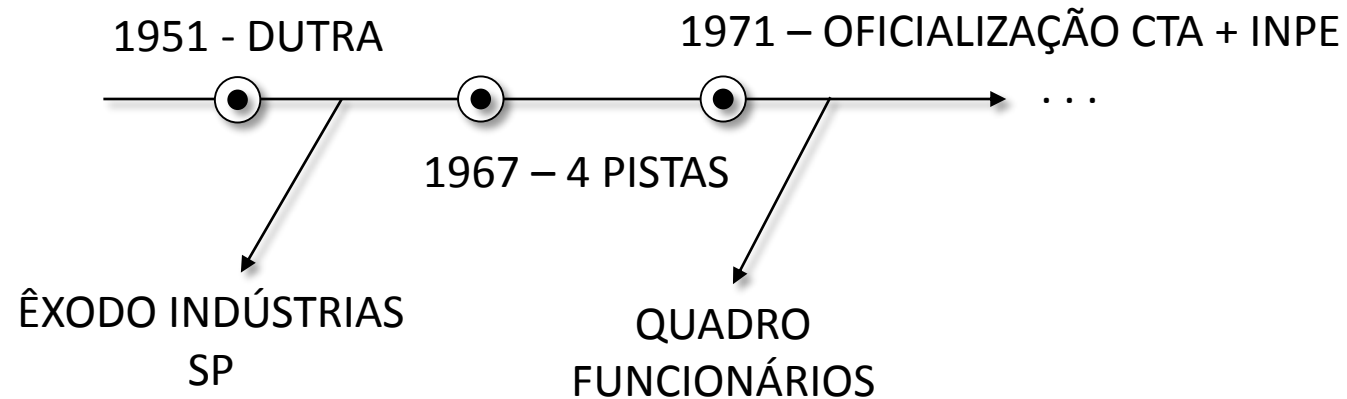
AGENTES:

- Custos no transporte
- Rodovias
- Agilidade
- Telecomunicação
- Profissionais Liberais
- Condomínios Residenciais

CONTEXTUALIZAÇÃO DO
FENÔMENO

DISPERSÃO URBANA

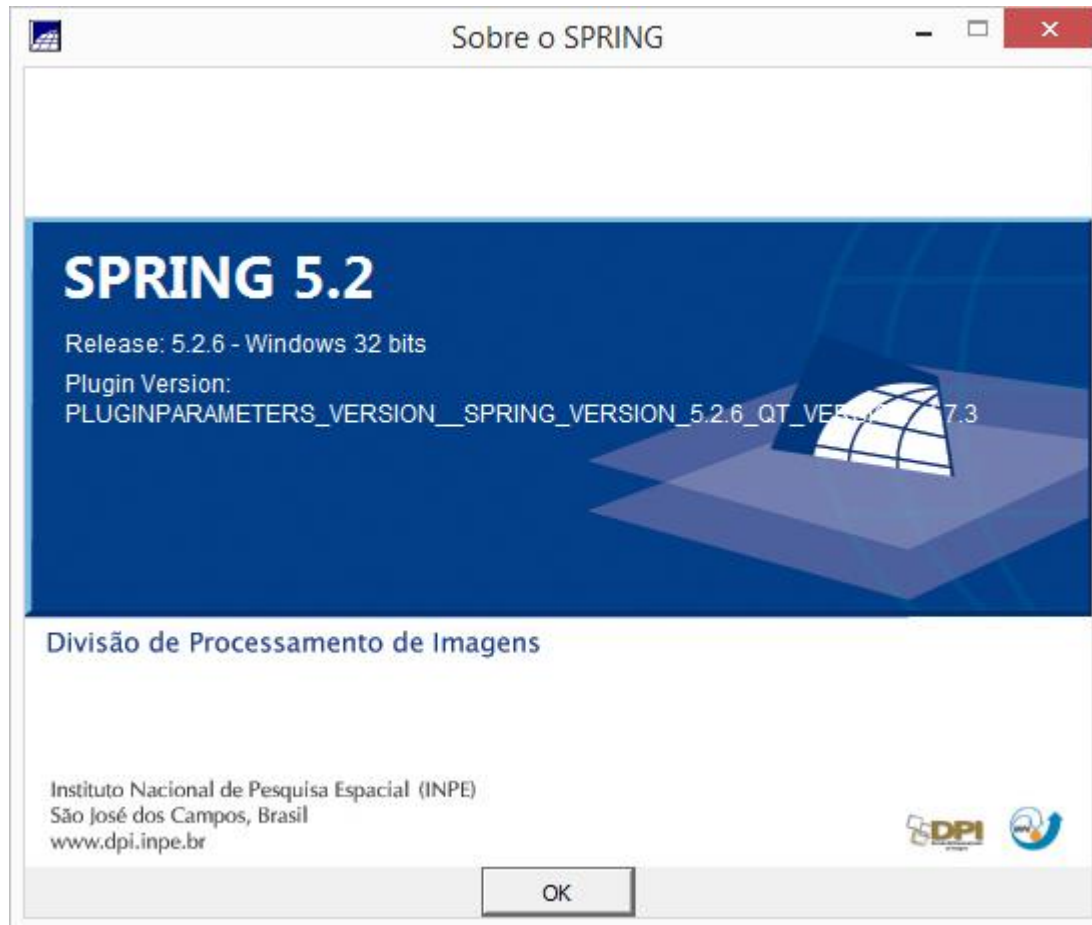
NO VALE DO PARAÍBA

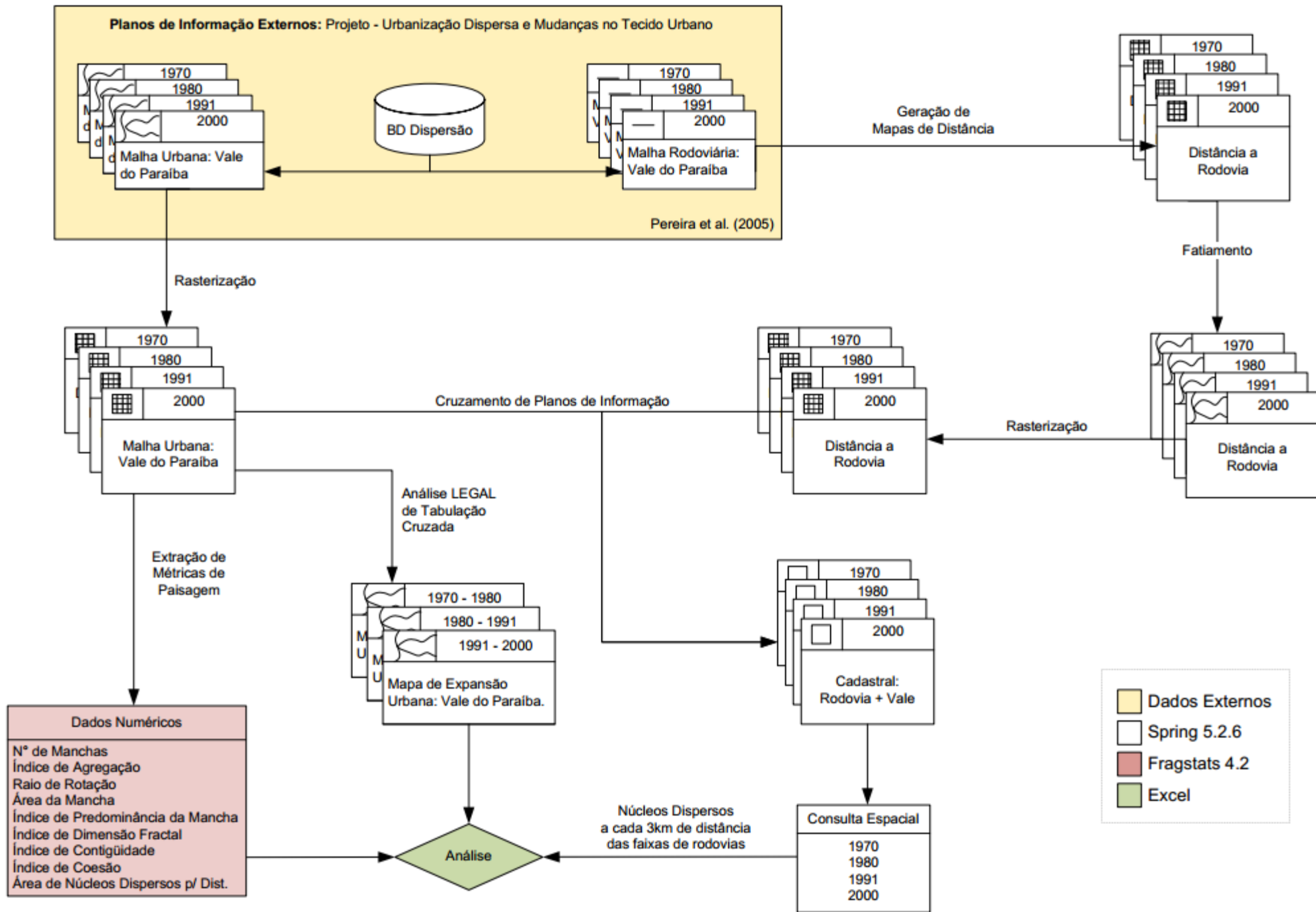


DISPERSÃO
URBANA

OBJETIVO

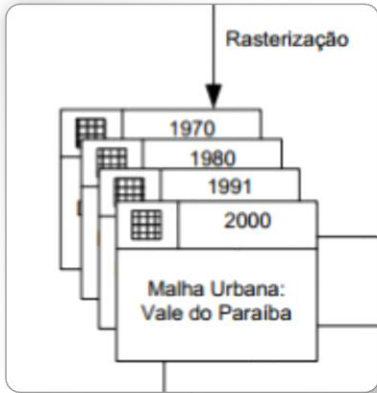
Compreender o comportamento do processo de dispersão do tecido urbano no Vale do Paraíba decorrente da urbanização, por meio de técnicas de geoprocessamento e análise das métricas de paisagem aplicadas aos dados obtidos.



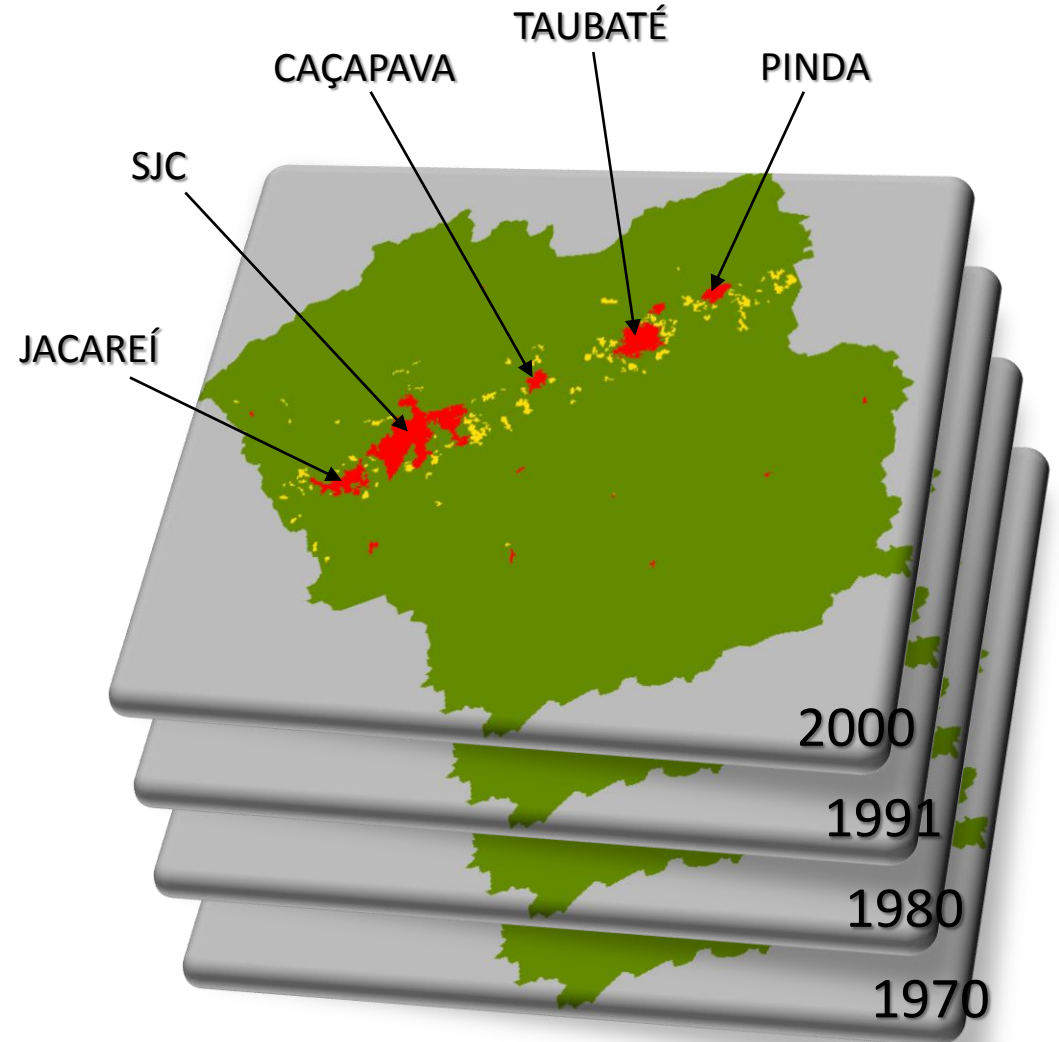
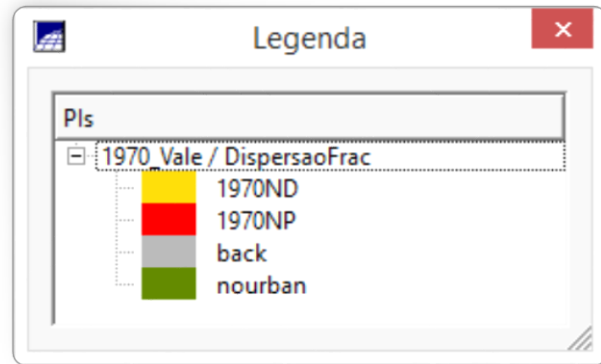
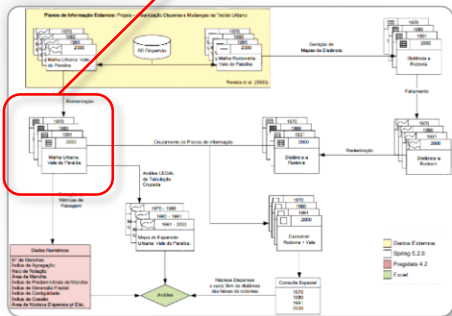


RASTERIZAÇÃO

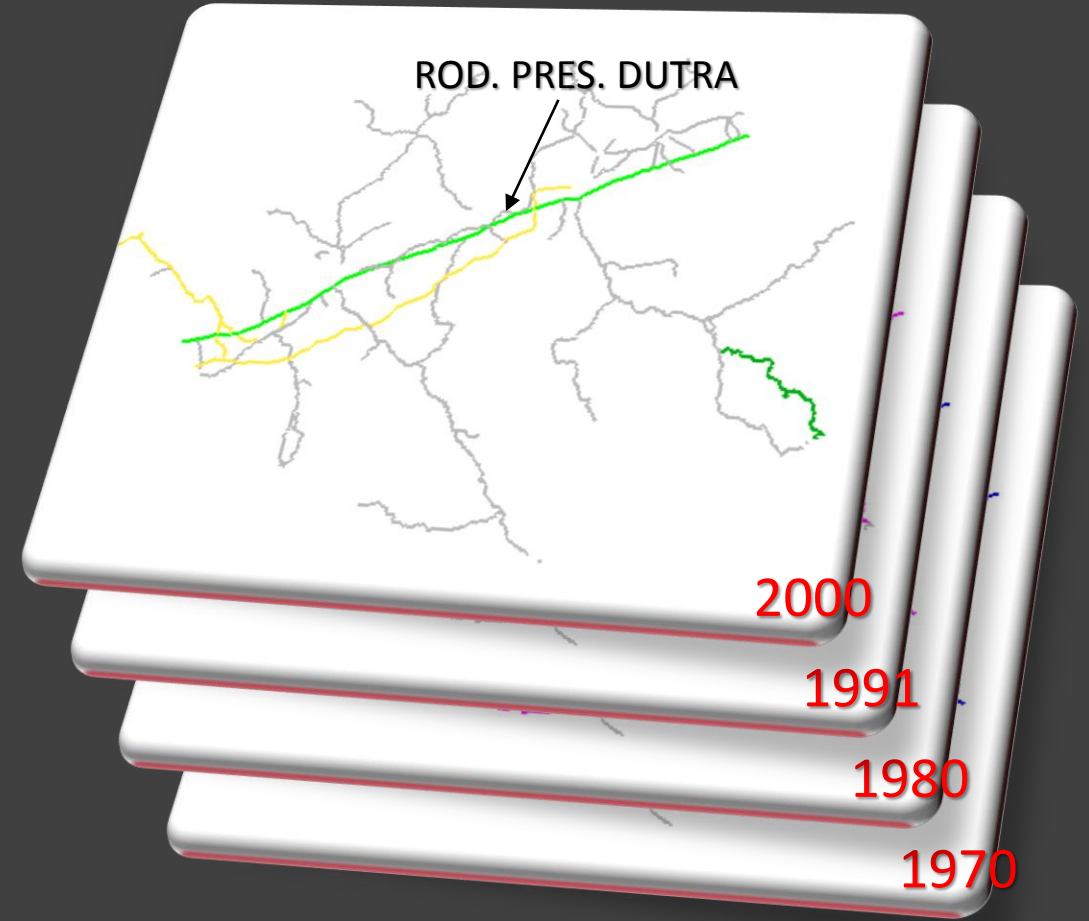
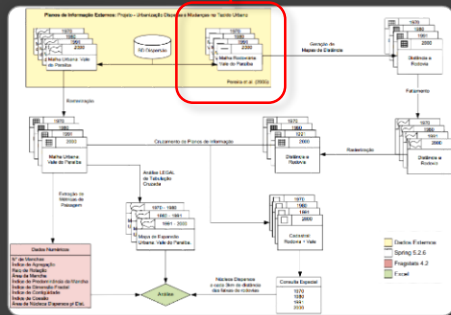
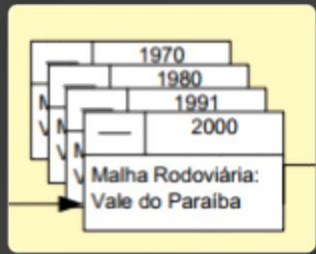
Pereira et al. (2005)



- NÚCLEOS PRINCIPAIS (NP)
- NÚCLEOS DISPERSOS (ND)



VETORES DE DISPERSÃO

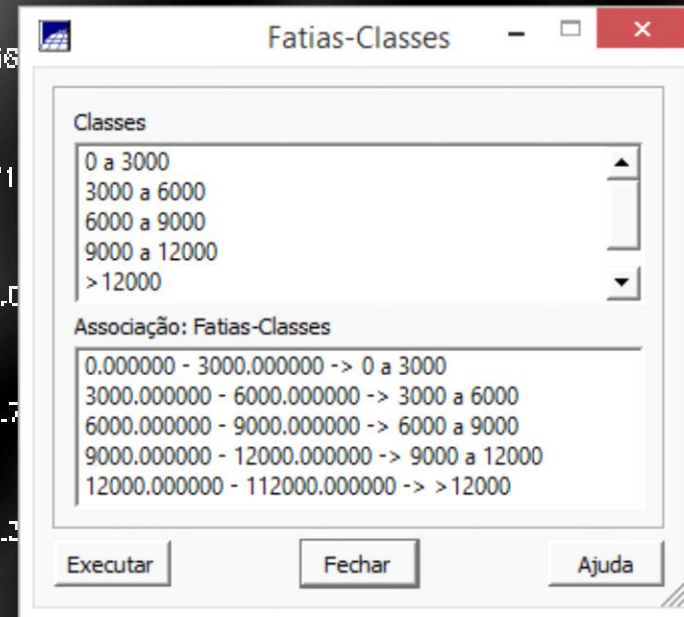
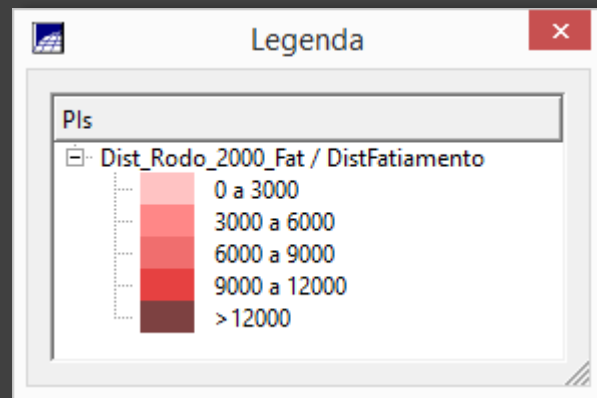
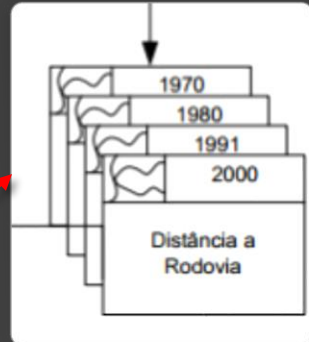
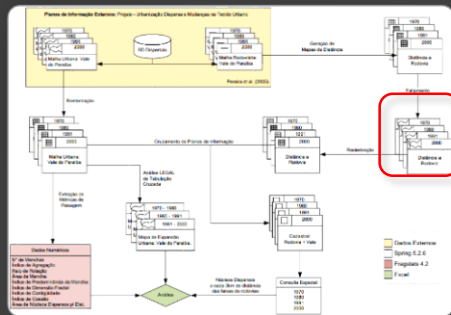


CLASSES POR
DISTÂNCIA

FATIAMENTO

Malha Rodoviária

1970

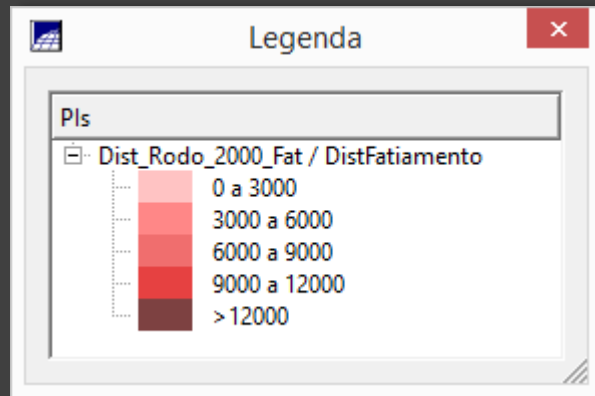
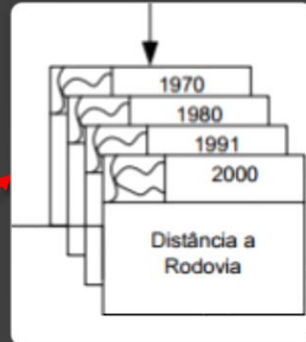
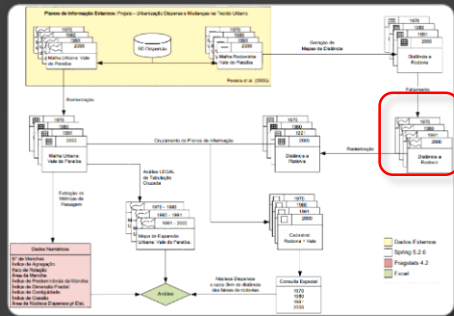


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681	31806	32505	22385	11684	2370.8	6515.4	2391.4	7270.0	6911.0	15729	25131	308
559	19418	20889	15158									
681	7036.1	10520	10971									
021	5174.6	681.1	7302.0									
809	14101	3683.7	1560.7									
948	20488	10952	7325.2									
817	26301	21285	13342	5403.7	13140	7671.8	1447.5	11174	21668	18788	17409	253
651	36222	30669	21946	17793	21608	14687	6807.9	10908	22659	29176	29799	346
620	48019	39343	33059	30183	32037	23899	19117	20477	28257	38268	42189	450

CLASSES POR
DISTÂNCIA

FATIAMENTO

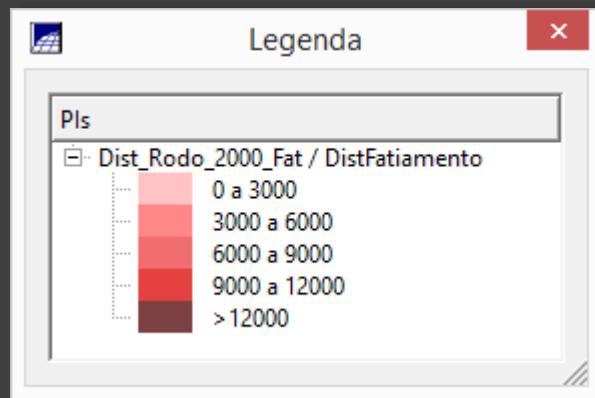
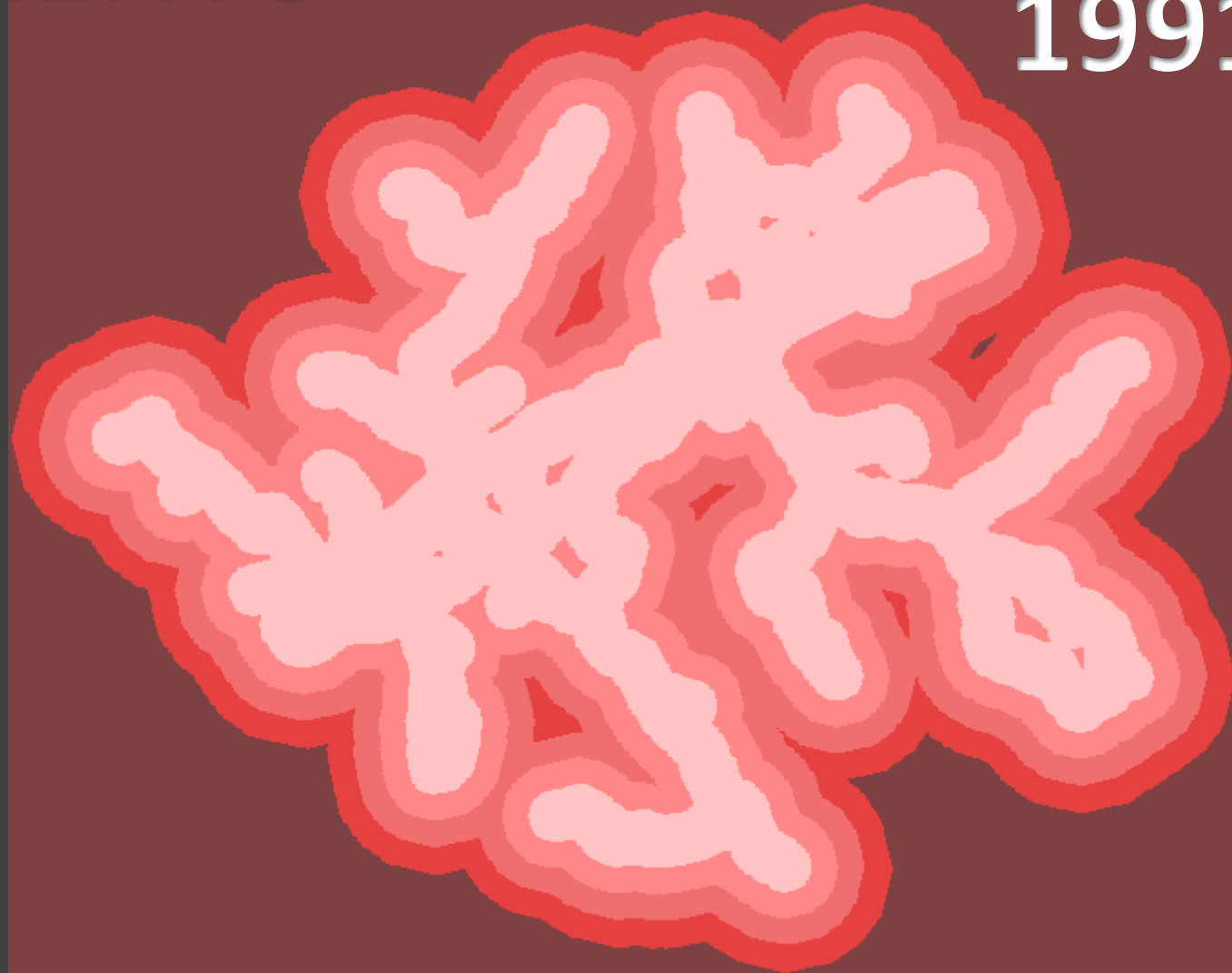
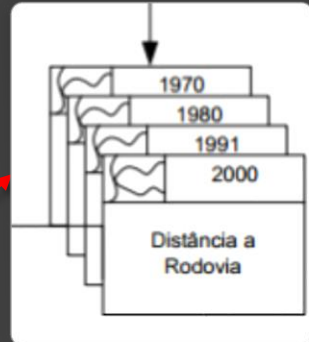
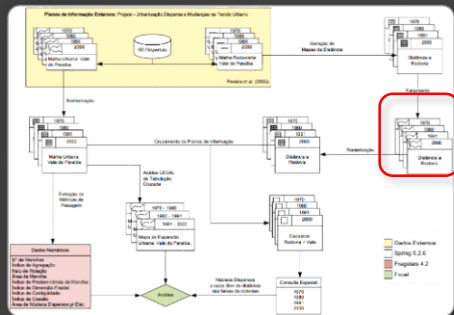
Malha Rodoviária
1980



CLASSES POR
DISTÂNCIA

FATIAMENTO

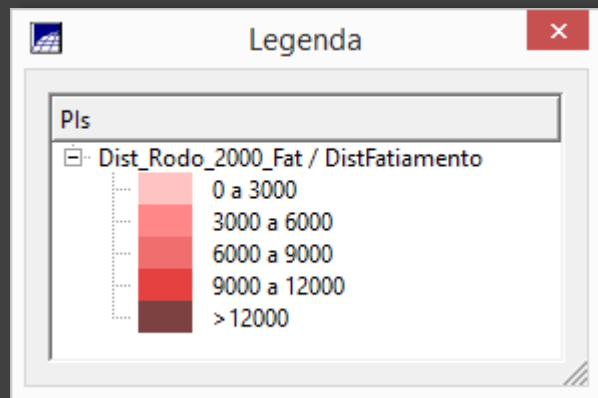
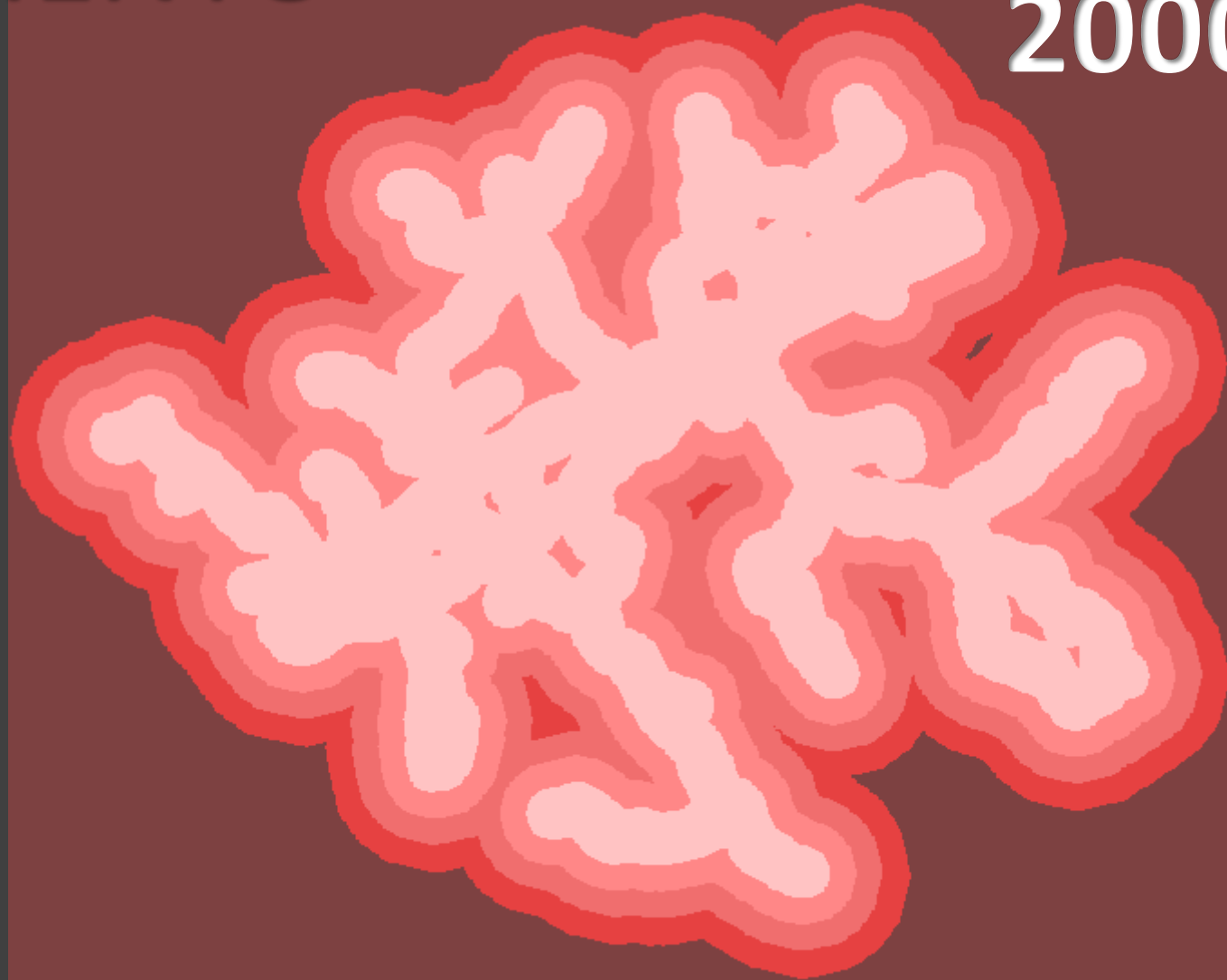
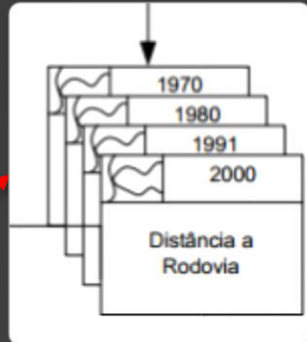
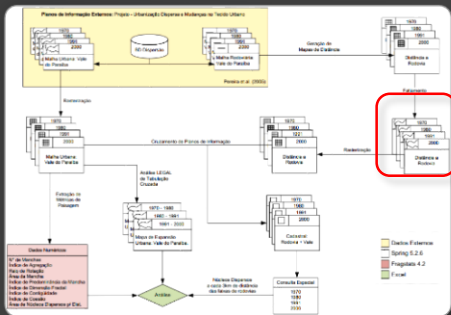
Malha Rodoviária
1991



CLASSES POR
DISTÂNCIA

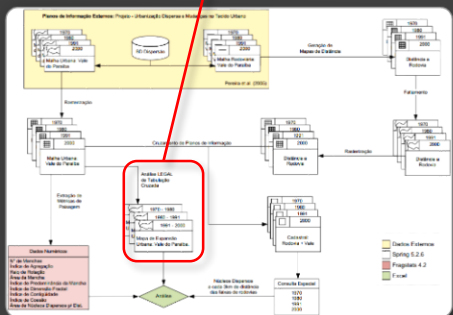
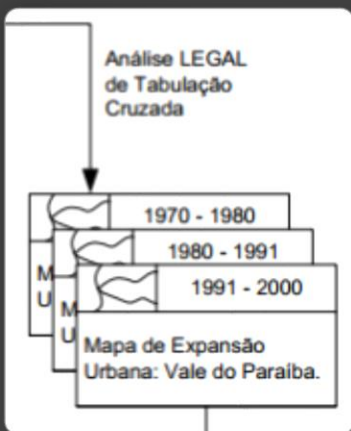
FATIAMENTO

Malha Rodoviária
2000



TAB. CRUZADA

1970 : 1980



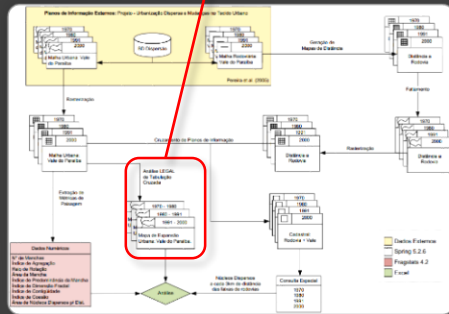
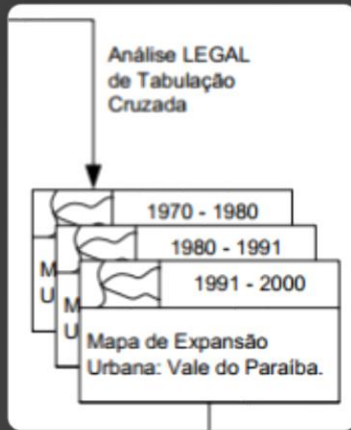
```
LEGAL
Programa LEGAL Executar
tabcruz_vale_70_80.alg | tabcruz_vale_80_91.alg | tabcruz_vale_91_00.alg |

1 {
2 //DECLARACAO TABCRUZ
3 Tematico vale70, vale80, result ("DispersãoFrac");
4
5 //INSTANCIACAO
6 vale70 = Recupere (Nome = "1970_Vale");
7 vale80 = Recupere (Nome = "1980_Vale");
8 result = Novo (Nome = "tabcruz_dispersao_70_80", ResX = 30, ResY = 30, Escala = 20000);
9
10 //OPERACAO
11 result = Atribua (CategoriaFim = "DispersãoFrac")
12 {
13 "bg_bg" : (vale70.Classe == "back" && vale80.Classe == "back"),//1 - 0;0
14 "nu_nu" : (vale70.Classe == "nourban" && vale80.Classe == "back"),//2 - 1;0 E
15 "bg_bg" : (vale70.Classe == "back" && vale80.Classe == "nourban"),//3 - 0;1 E
16 "nu_nu" : (vale70.Classe == "nourban" && vale80.Classe == "nourban"),//4 - 1;1
17 "np_np" : (vale70.Classe == "1970NP" && vale80.Classe == "nourban"),//5 - 2;1 E
18 "nd_nd" : (vale70.Classe == "1970ND" && vale80.Classe == "nourban"),//6 - 3;1 E
19 "nu_np" : (vale70.Classe == "nourban" && vale80.Classe == "1980NP"),//7 - 1;2
20 "np_np" : (vale70.Classe == "1970NP" && vale80.Classe == "1980NP"),//8 - 2;2
21 "nd_np" : (vale70.Classe == "1970ND" && vale80.Classe == "1980NP"),//9 - 3;2
22 "bg_bg" : (vale70.Classe == "back" && vale80.Classe == "1980ND"),//10 - 0;3 E
23 "nu_nd" : (vale70.Classe == "nourban" && vale80.Classe == "1980ND"),//11 - 1;3
24 "np_np" : (vale70.Classe == "1970NP" && vale80.Classe == "1980ND"),//12 - 2;3 E
25 "nd_nd" : (vale70.Classe == "1970ND" && vale80.Classe == "1980ND");//13 - 3;3
26 }

Erros de Sintaxe do Programa
```

TAB. CRUZADA

1980 : 1991



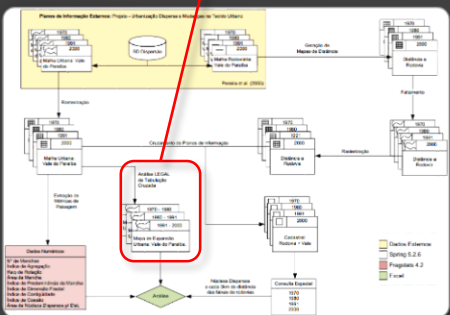
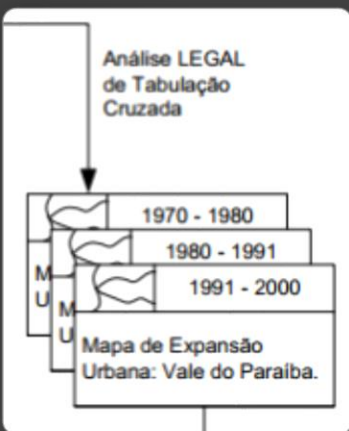
```
LEGAL
Programa EGA  Executar
tabcruz_vale_70_80.alg  tabcruz_vale_80_91.alg  tabcruz_vale_91_00.alg

1  {
2  //DECLARACAO TABCRUZ
3  Tematico vale80, vale91, result ("DispersãoFrac");
4
5  //INSTANCIACAO
6  vale80 = Recupere (Nome = "1980_Vale");
7  vale91 = Recupere (Nome = "1991_Vale");
8  result = Novo (Nome = "tabcruz_dispersao_80_91", ResX = 30, ResY = 30, Escala = 20000);
9
10 //OPERACAO
11 result = Atribua (CategoriaFim = "DispersãoFrac")
12 {
13 "bg_bg" : (vale80.Classe == "back" && vale91.Classe == "back"),//1 - 0;0
14 "nu_nu" : (vale80.Classe == "nourban" && vale91.Classe == "nourban"),//2 - 1;1
15 "np_np" : (vale80.Classe == "1980NP" && vale91.Classe == "nourban"),//3 - 2;1 E
16 "nd_nd" : (vale80.Classe == "1980ND" && vale91.Classe == "nourban"),//4 - 3;1 E
17 "nu_np" : (vale80.Classe == "nourban" && vale91.Classe == "1991NP"),//5 - 1;2
18 "np_np" : (vale80.Classe == "1980NP" && vale91.Classe == "1991NP"),//6 - 2;2
19 "nd_np" : (vale80.Classe == "1980ND" && vale91.Classe == "1991NP"),//7 - 3;2
20 "nu_nd" : (vale80.Classe == "nourban" && vale91.Classe == "1991ND"),//8 - 1;3
21 "np_np" : (vale80.Classe == "1980NP" && vale91.Classe == "1991ND"),//9 - 2;3 E
22 "nd_nd" : (vale80.Classe == "1980ND" && vale91.Classe == "1991ND");//10 - 3;3
23 }
```

Erros de Sintaxe do Programa

TAB. CRUZADA

1991 : 2000



LEGAL

Programa EGA Executar

tabcruz_vale_70_80.alg | tabcruz_vale_80_91.alg | tabcruz_vale_91_00.alg

```

1  {
2  //DECLARACAO TABCRUZ
3  Tematico vale91, vale00, result ("DispersãoFrac");
4
5  //INSTANCIACAO
6  vale91 = Recupere (Nome = "1991_Vale");
7  vale00 = Recupere (Nome = "2000_Vale");
8  result = Novo (Nome = "tabcruz_dispersao_91_00", ResX = 30, ResY = 30, Escala = 20000);
9
10 //OPERACAO
11 result = Atribua (CategoriaFim = "DispersãoFrac")
12 {
13 "bg_bg" : (vale91.Classe == "back" && vale00.Classe == "back"),//1 - 0;0
14 "nu_nu" : (vale91.Classe == "nourban" && vale00.Classe == "nourban"),//2 - 1;1
15 "np_np" : (vale91.Classe == "1991NP" && vale00.Classe == "nourban"),//3 - 2;1 E
16 "nd_nd" : (vale91.Classe == "1991ND" && vale00.Classe == "nourban"),//4 - 3;1 E
17 "nu_np" : (vale91.Classe == "nourban" && vale00.Classe == "2000NP"),//5 - 1;2
18 "np_np" : (vale91.Classe == "1991NP" && vale00.Classe == "2000NP"),//6 - 2;2
19 "nd_np" : (vale91.Classe == "1991ND" && vale00.Classe == "2000NP"),//7 - 3;2
20 "nu_nd" : (vale91.Classe == "nourban" && vale00.Classe == "2000ND"),//8 - 1;3
21 "nd_nd" : (vale91.Classe == "1991ND" && vale00.Classe == "2000ND")};//9 - 3;3
22 }
                
```

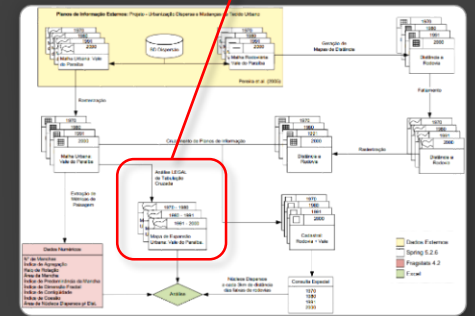
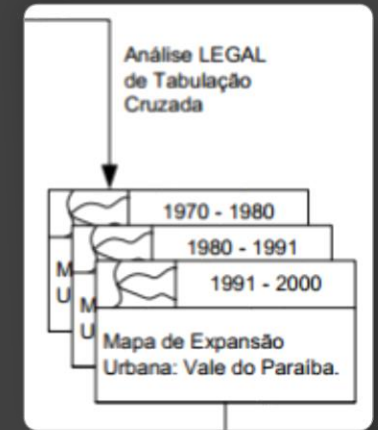
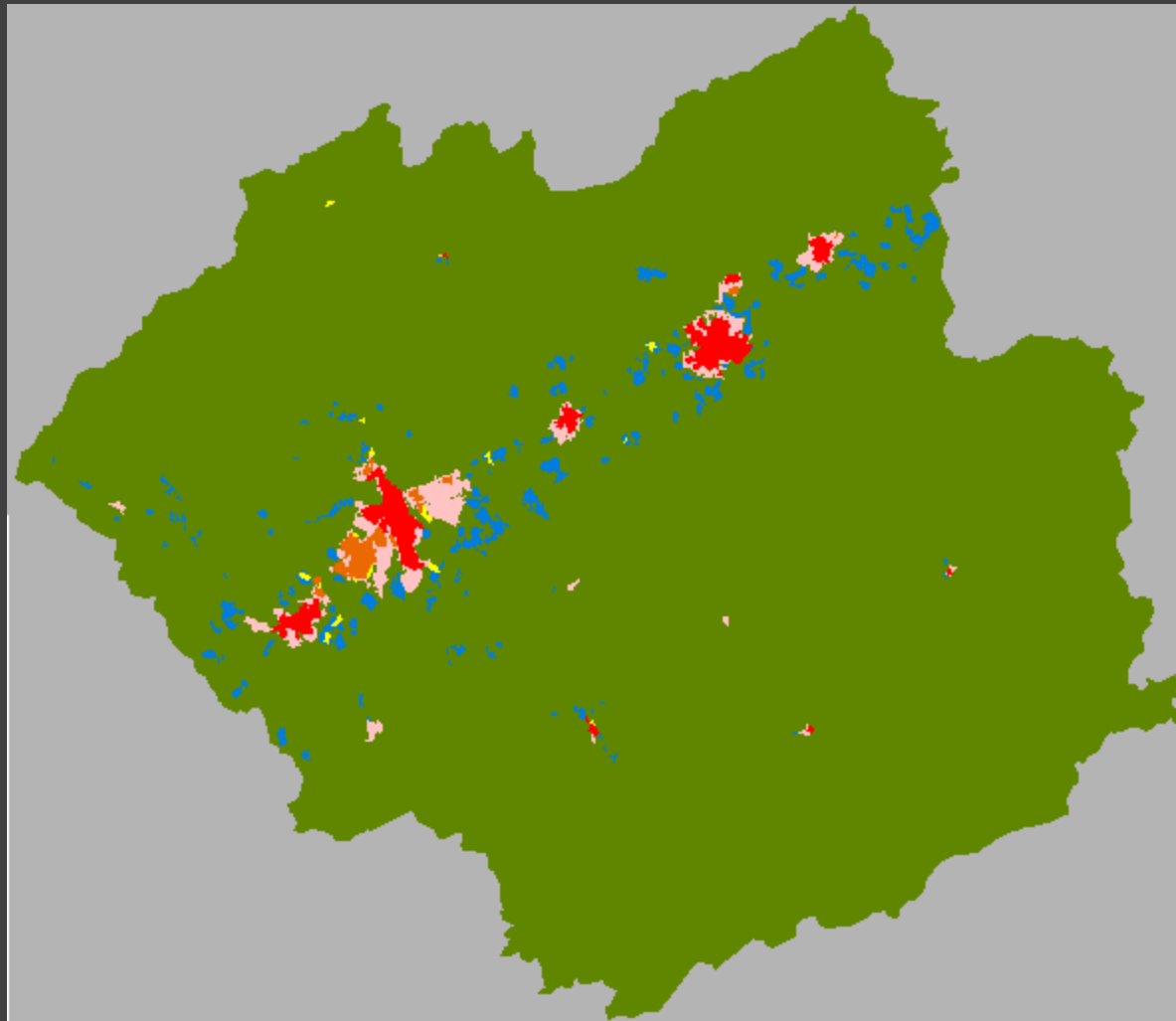
Erros de Sintaxe do Programa

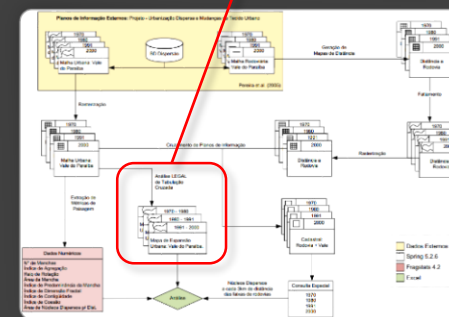
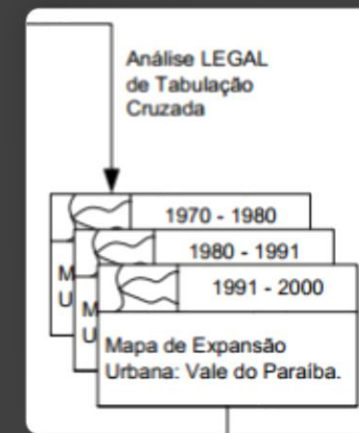
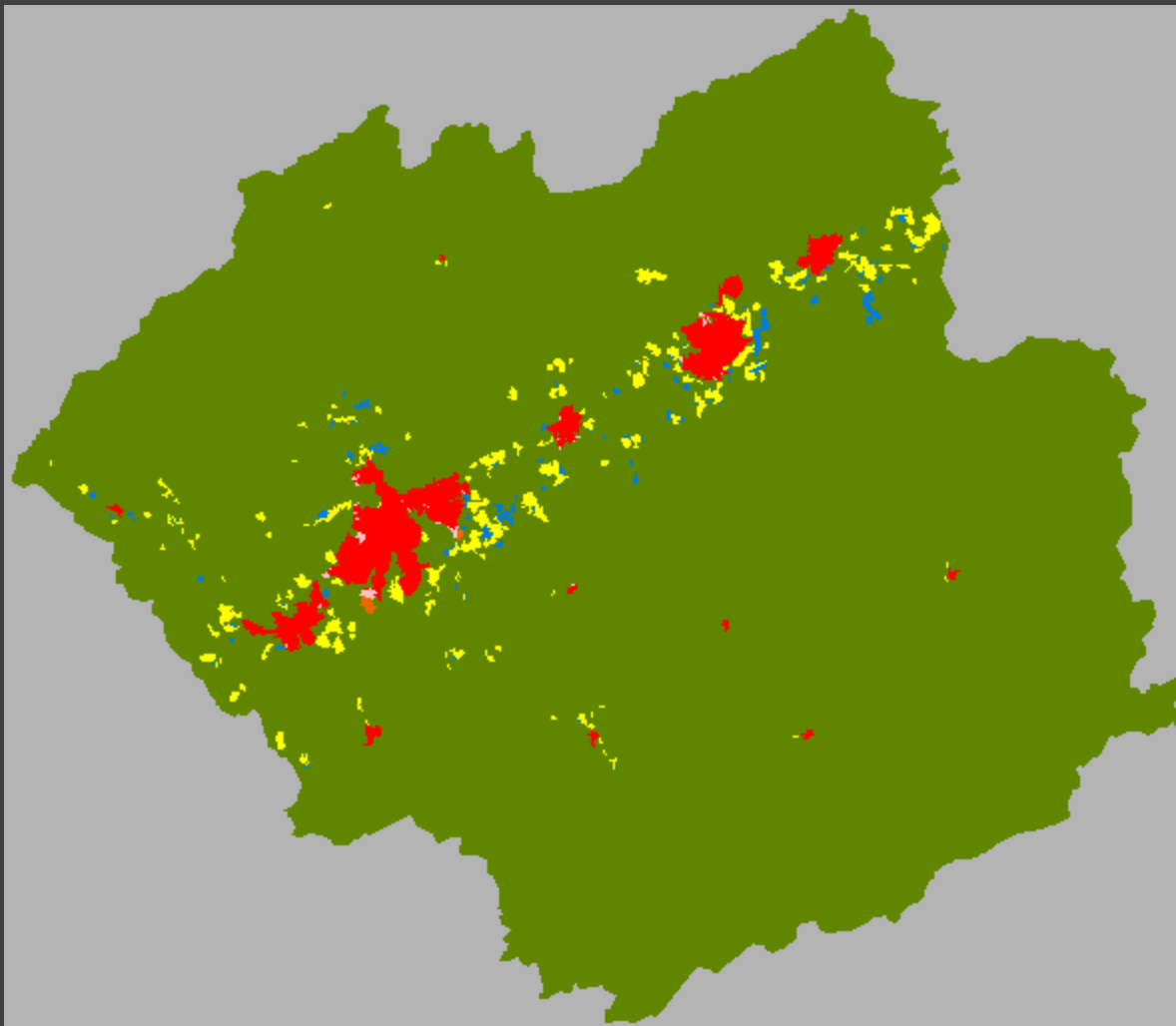
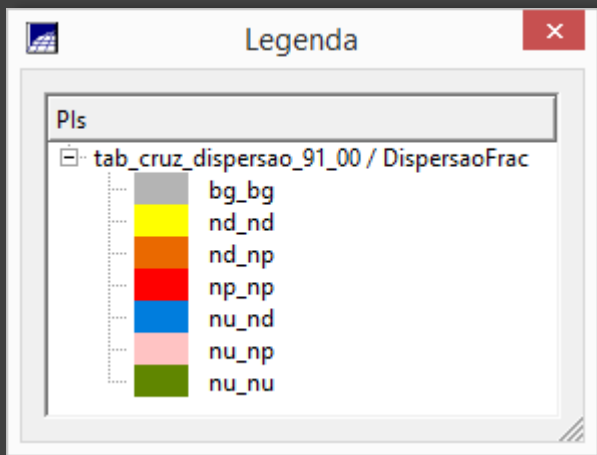
Legenda

Pls

tab_cruz_dispersao_91_00 / DispersaoFrac

bg_bg	nd_nd
nd_np	np_np
nu_nd	nu_np
nu_np	nu_nu



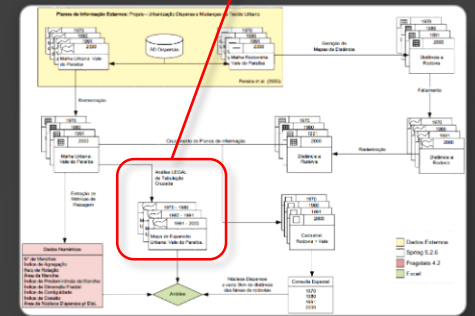
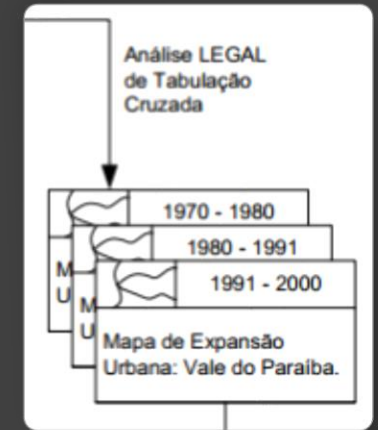
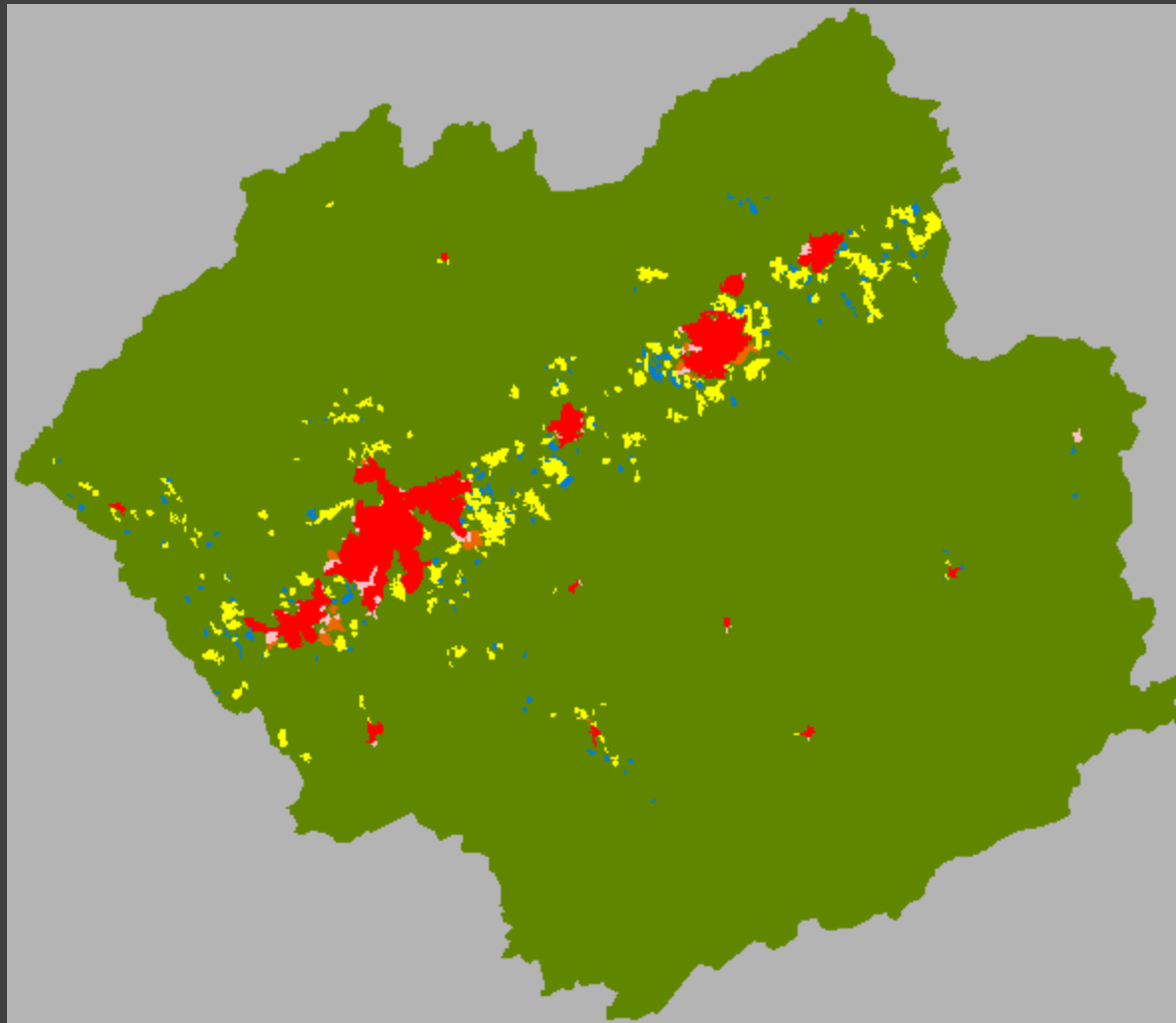


Legenda

Pls

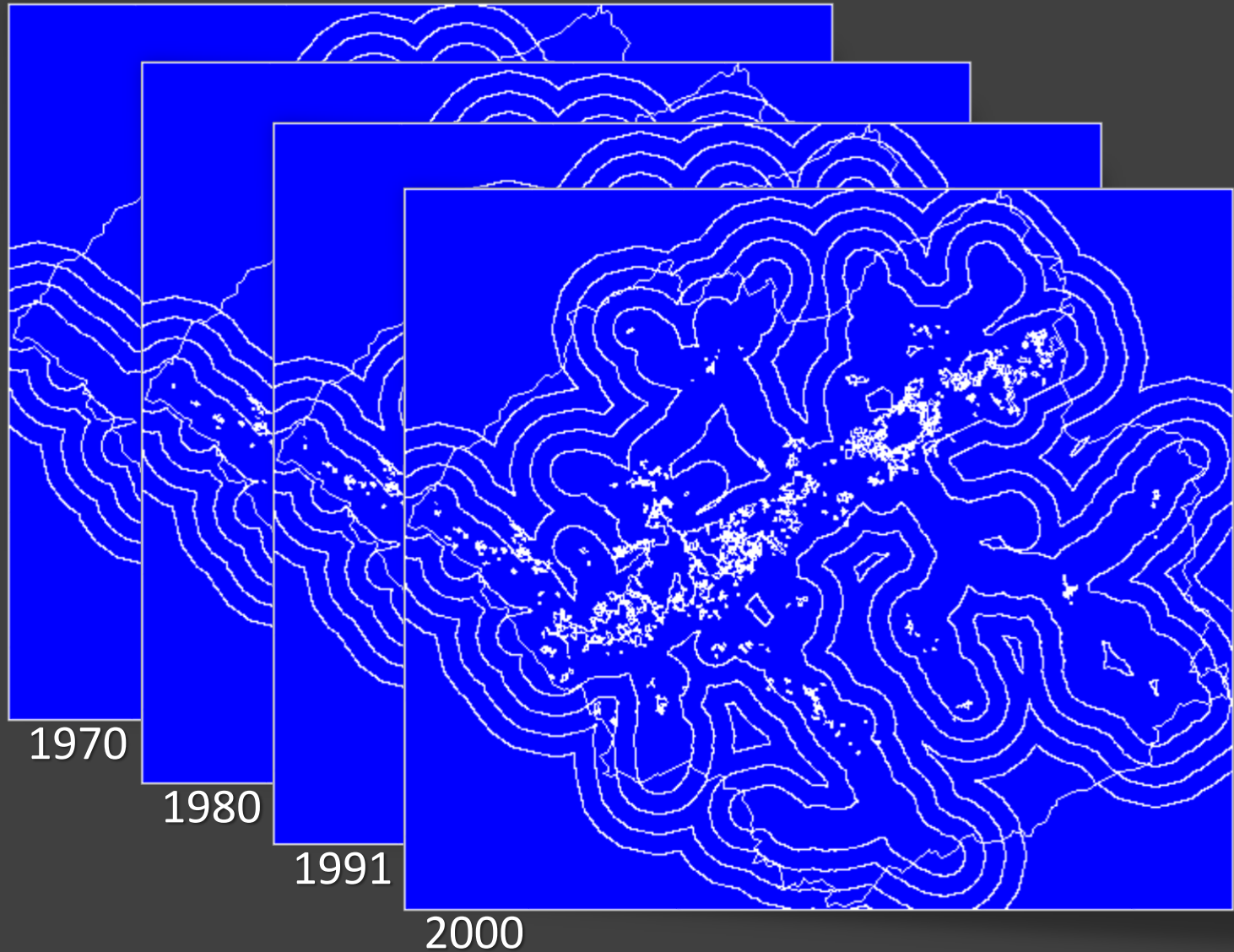
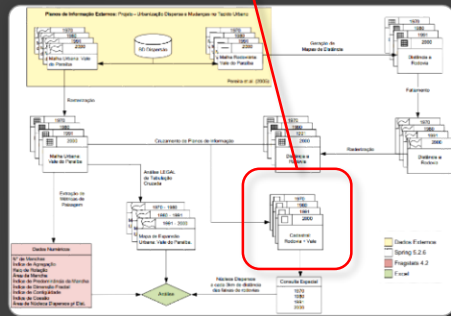
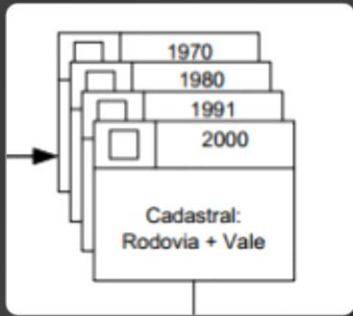
tab_cruz_dispersao_91_00 / DispersaoFrac

Grey	bg_bg
Yellow	nd_nd
Orange	nd_np
Red	np_np
Blue	nu_nd
Pink	nu_np
Green	nu_nu

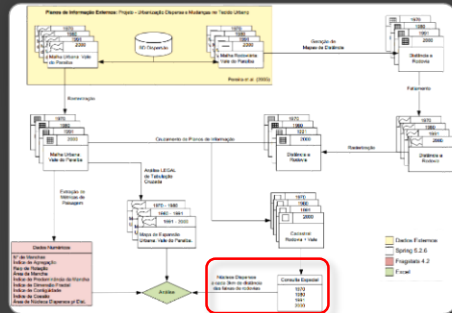


Cruzamento
De P.I.

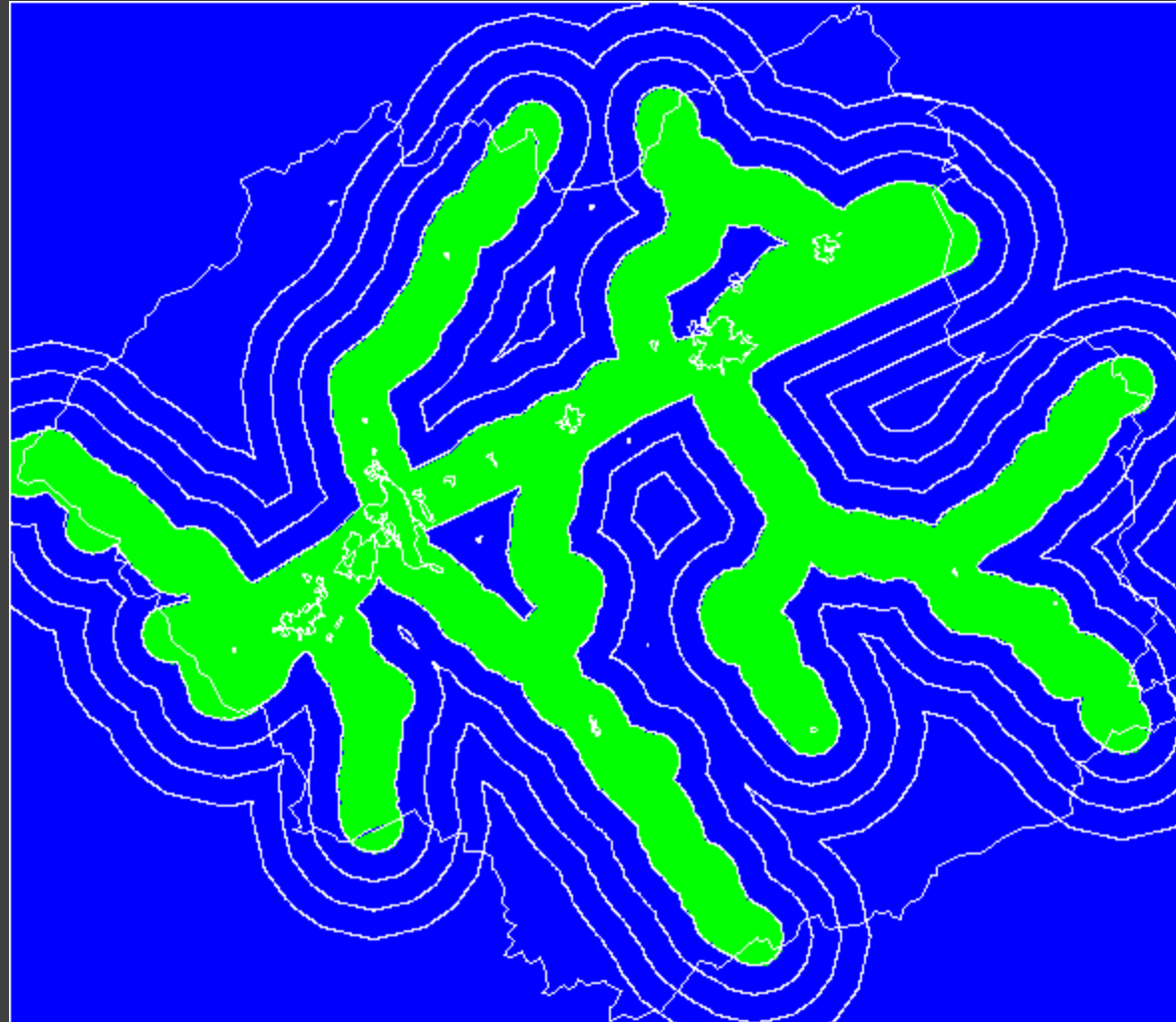
RODOVIA + VALE



ND's: DIST. RODOVIAS



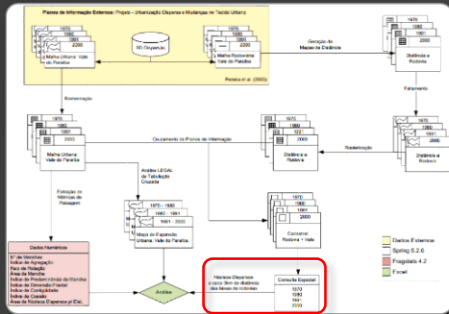
Núcleos Dispersos a cada 3km de distância das faixas de rodovias	Consulta Espacial
	1970
	1980
	1991
	2000



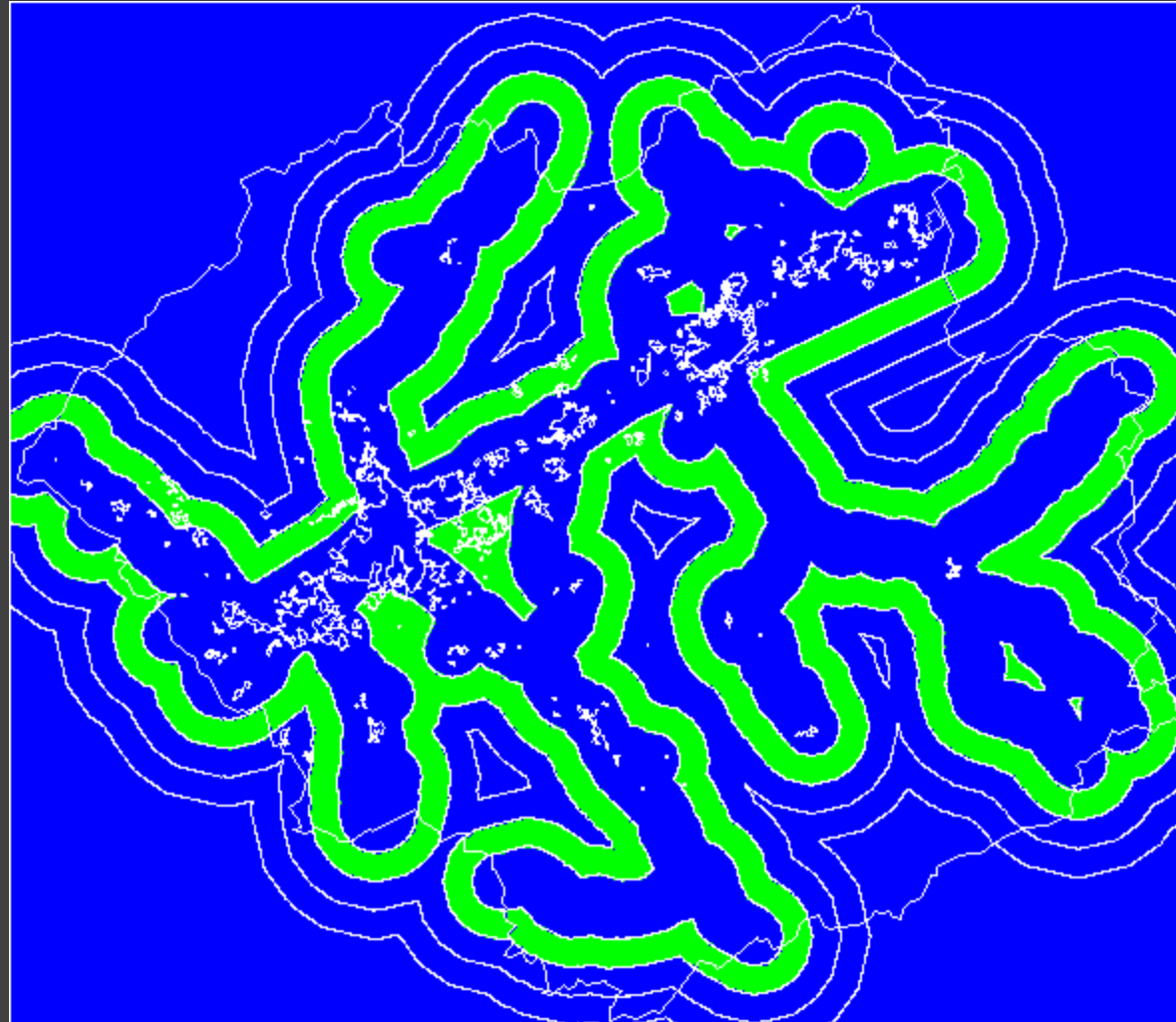
0 a 3km

Ano	N°
1970	20
1980	273
1991	371
2000	505

ND's: DIST. RODOVIAS



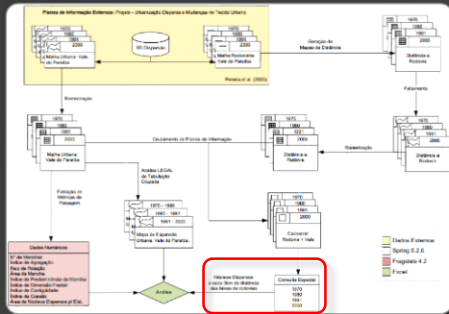
Núcleos Dispersos a cada 3km de distância das faixas de rodovias	Consulta Espacial
	1970
	1980
	1991
	2000



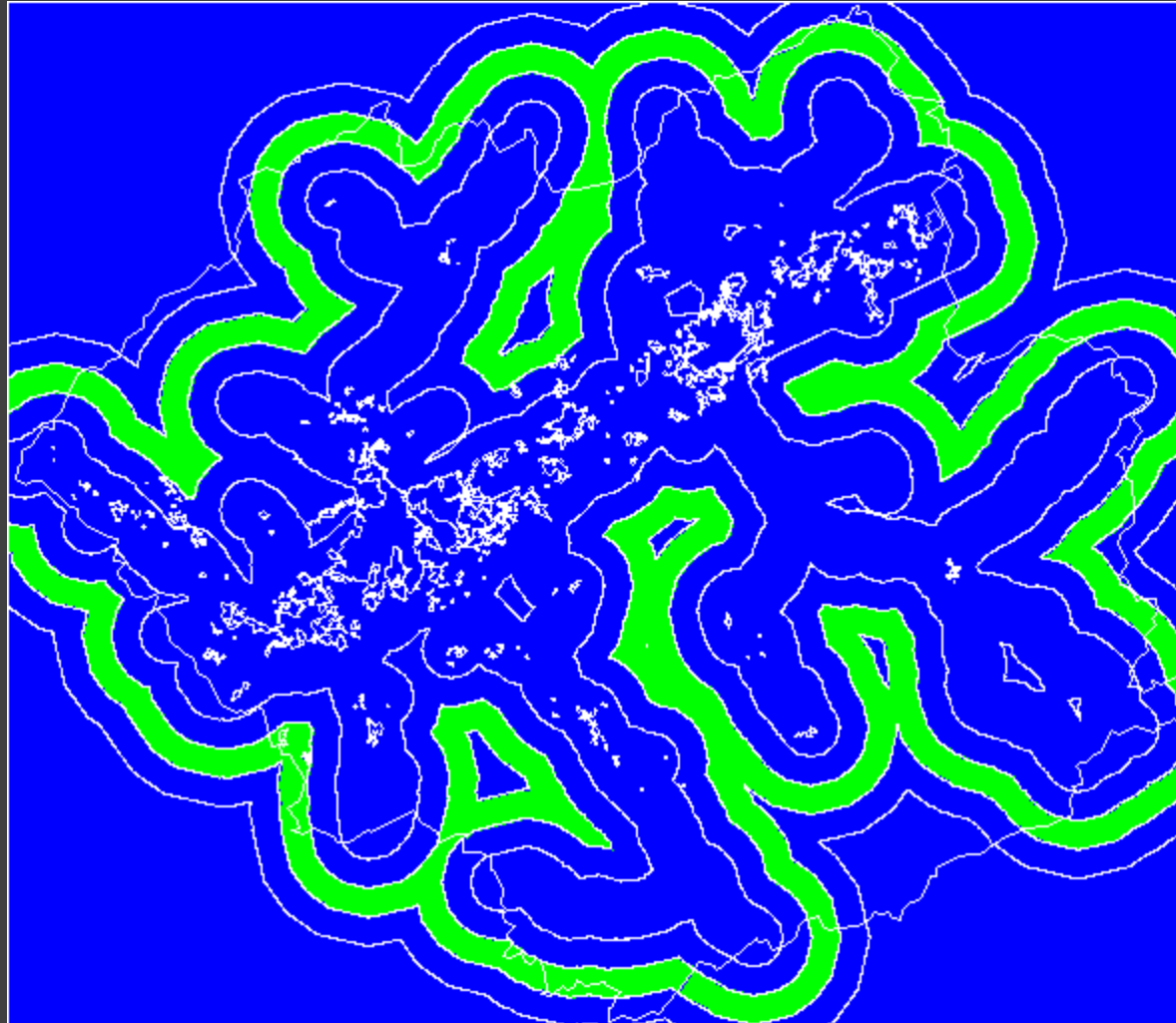
3 a 6km

Ano	N°
1970	1
1980	59
1991	45
2000	65

ND's: DIST. RODOVIAS

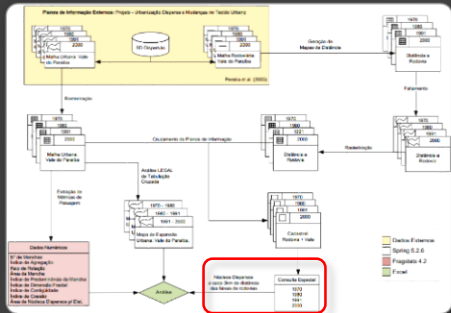


Núcleos Dispersos a cada 3km de distância das faixas de rodovias	Consulta Espacial
	1970
	1980
	1991
	2000

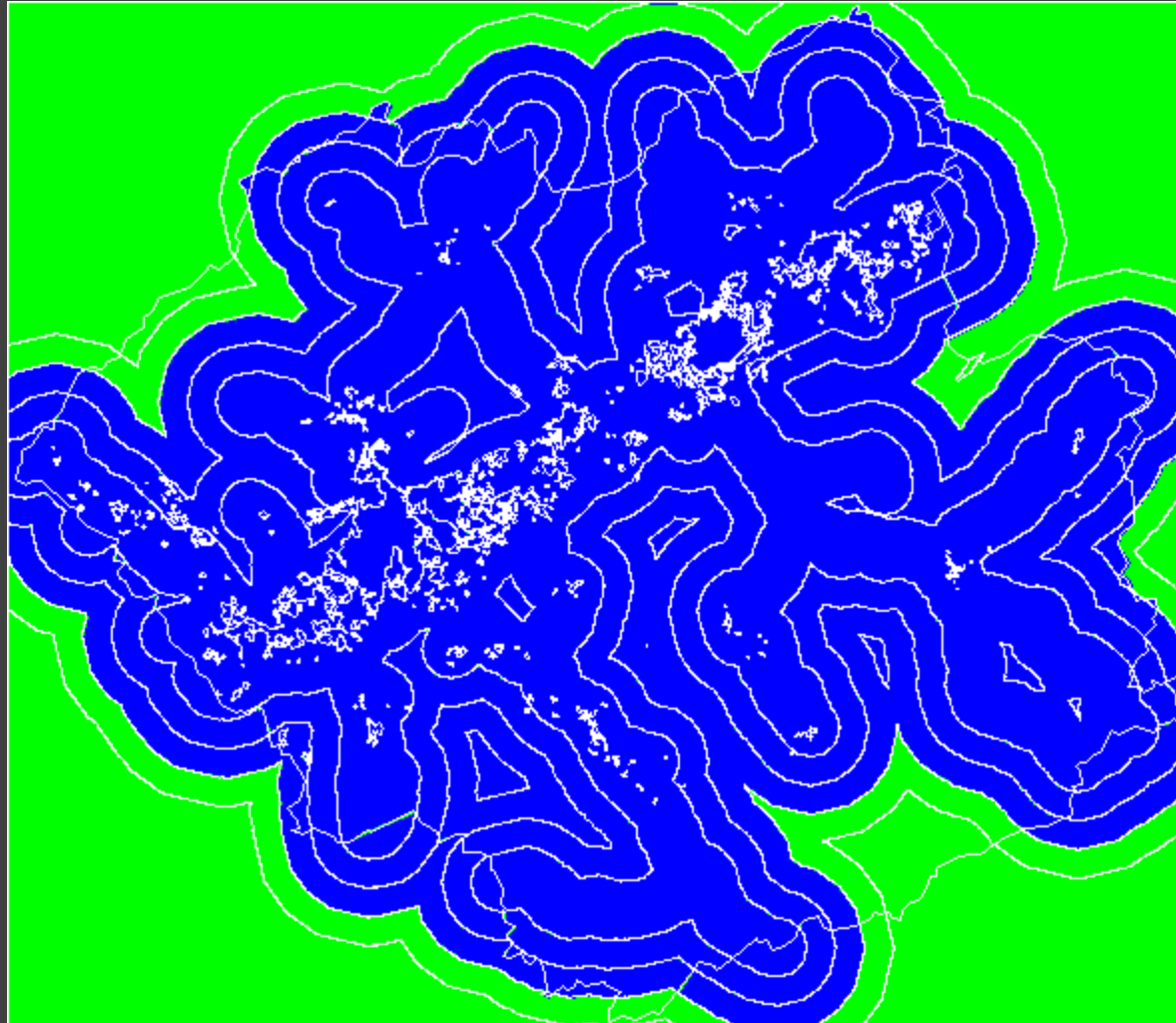


6 a 9km

Ano	Nº
1970	0
1980	12
1991	6
2000	7



Núcleos Dispersos a cada 3km de distância das faixas de rodovias	Consulta Espacial
	1970
	1980
	1991
	2000



9 a 12km

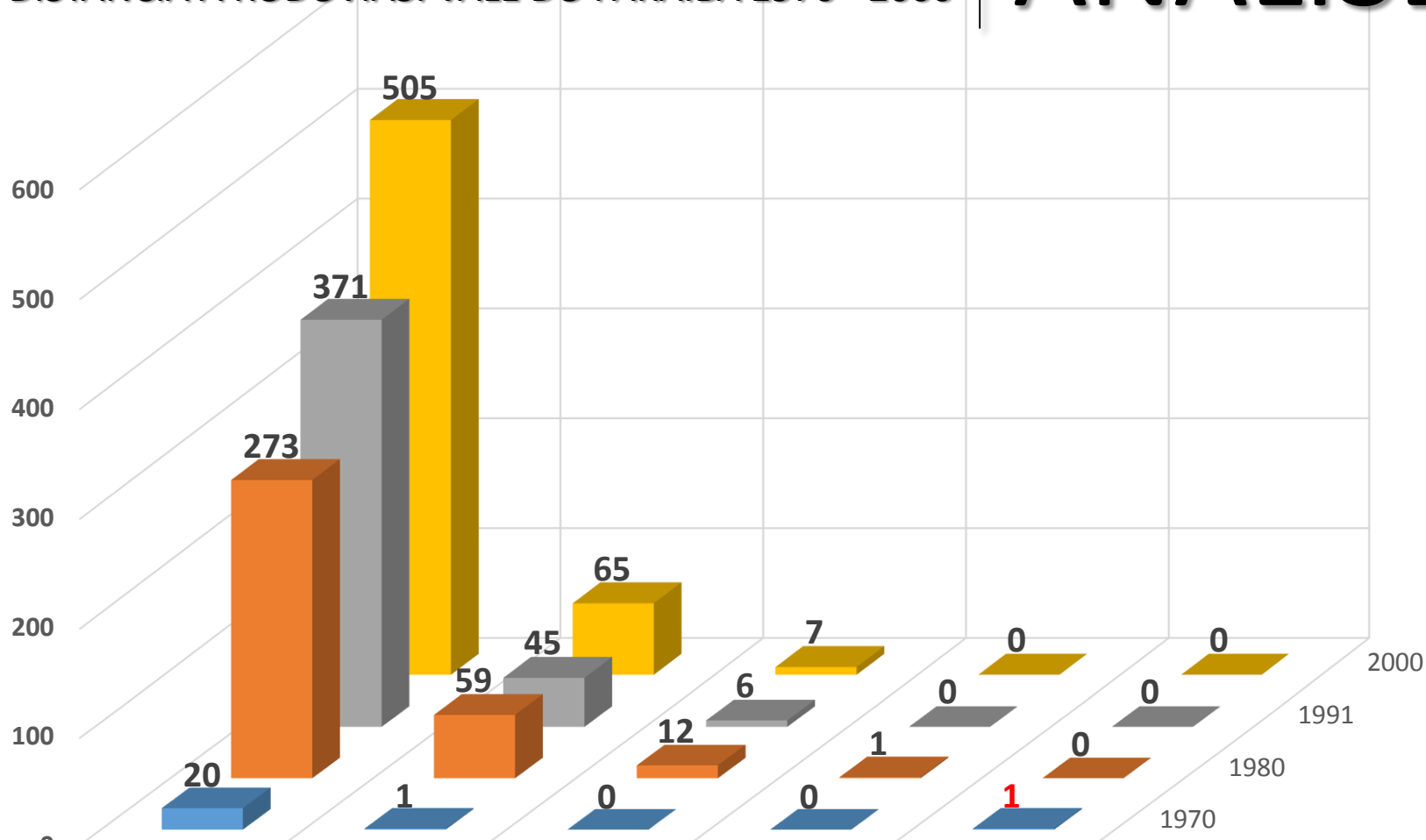
Ano	N°
1970	0
1980	1
1991	0
2000	0

>12km

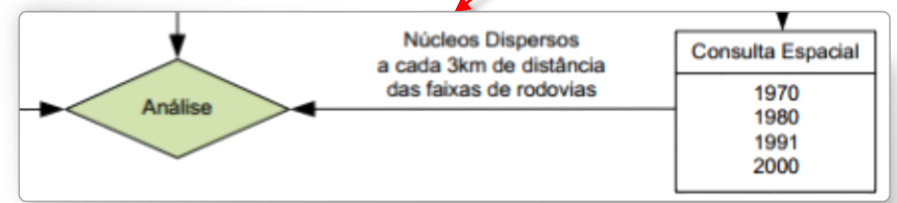
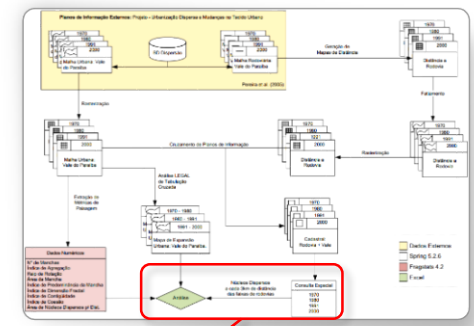
Ano	N°
1970	1
1980	0
1991	0
2000	0

DISTRIBUIÇÃO DE NÚCLEOS DISPERSOS POR FAIXA DE DISTÂNCIA À RODOVIAS: VALE DO PARAÍBA 1970 - 2000

ANÁLISE DE CONSUTA



	0 a 3km	3 a 6km	6 a 9km	9 a 12km	acima de 12km
1970	20	1	0	0	1
1980	273	59	12	1	0
1991	371	45	6	0	0
2000	505	65	7	0	0



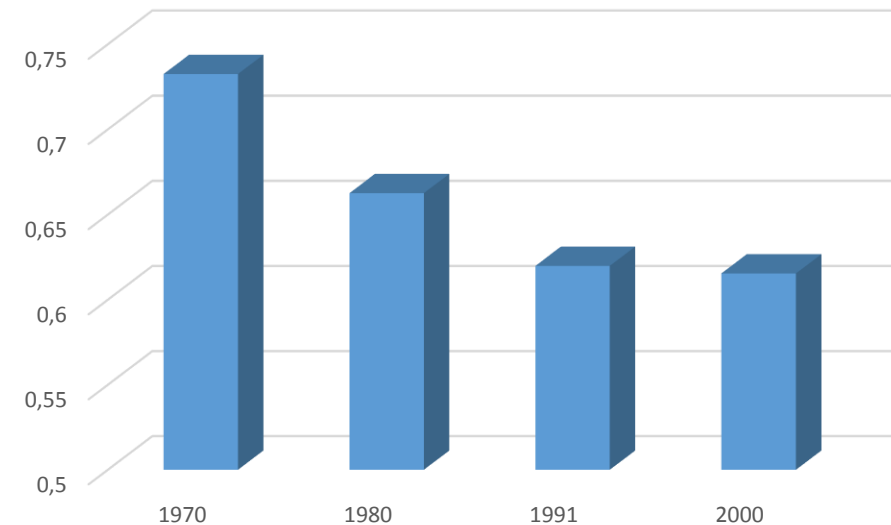
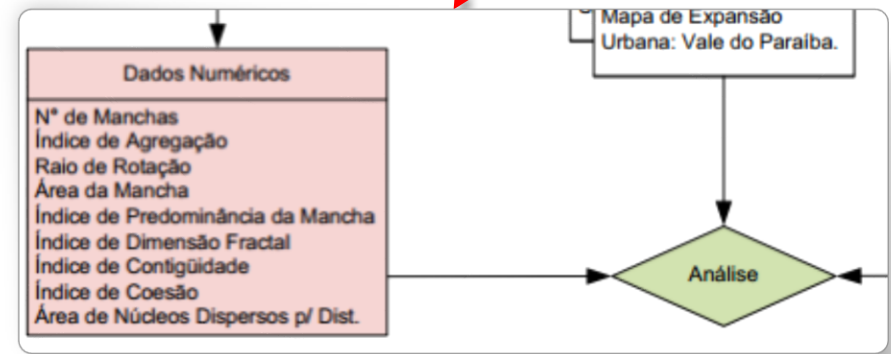
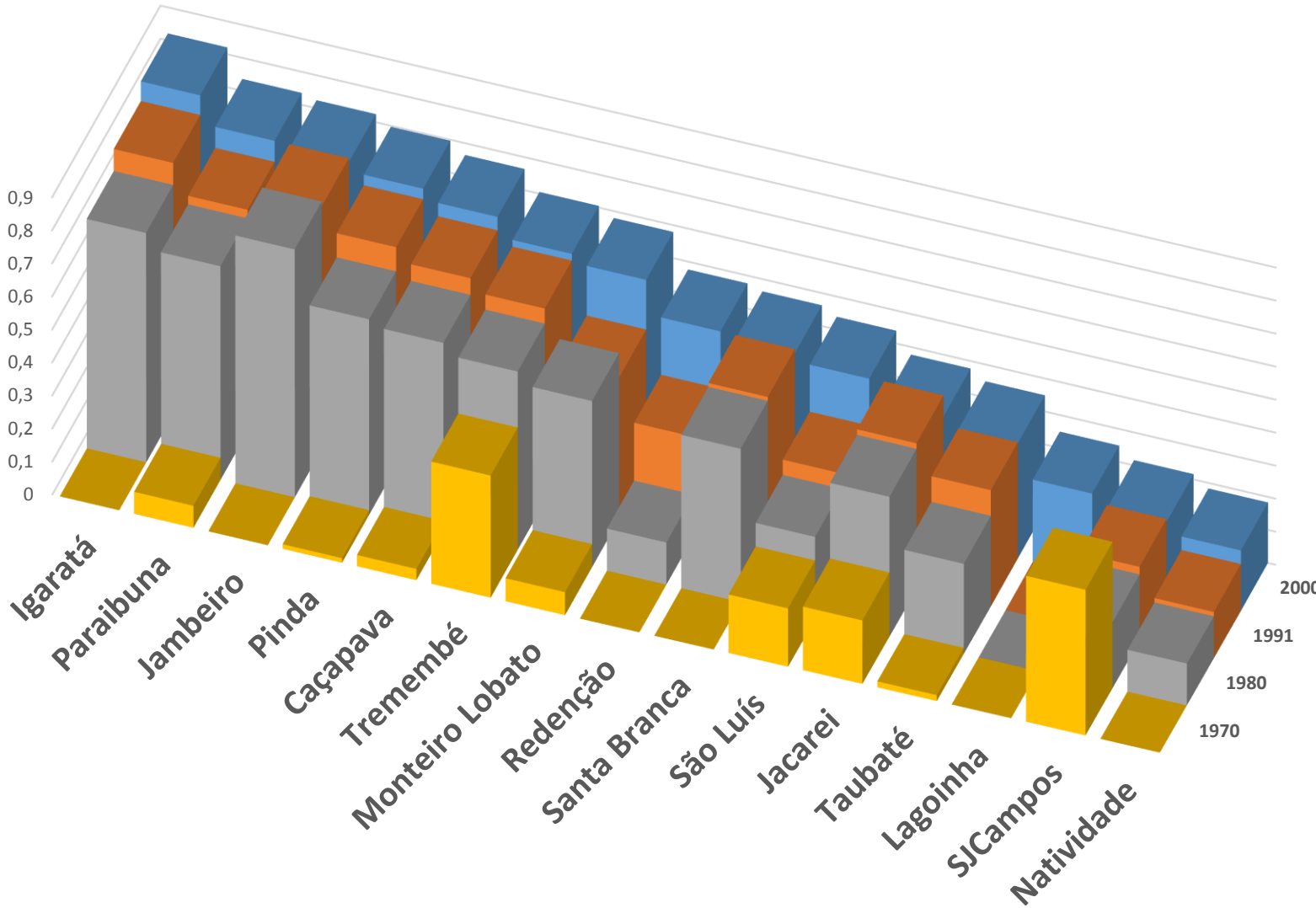
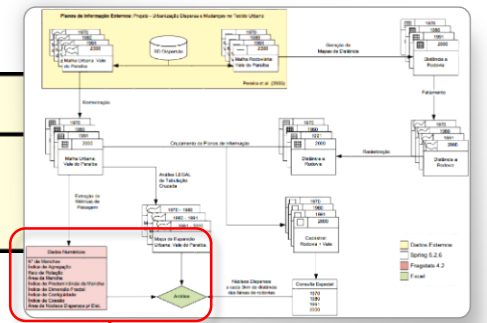
ANÁLISE DE MÉTRICAS

AREA

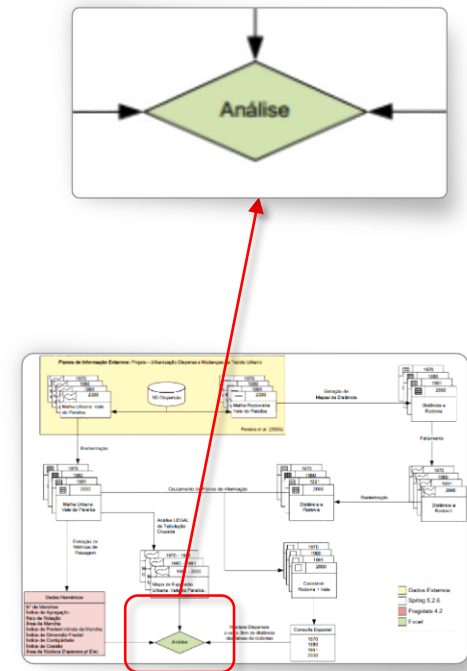
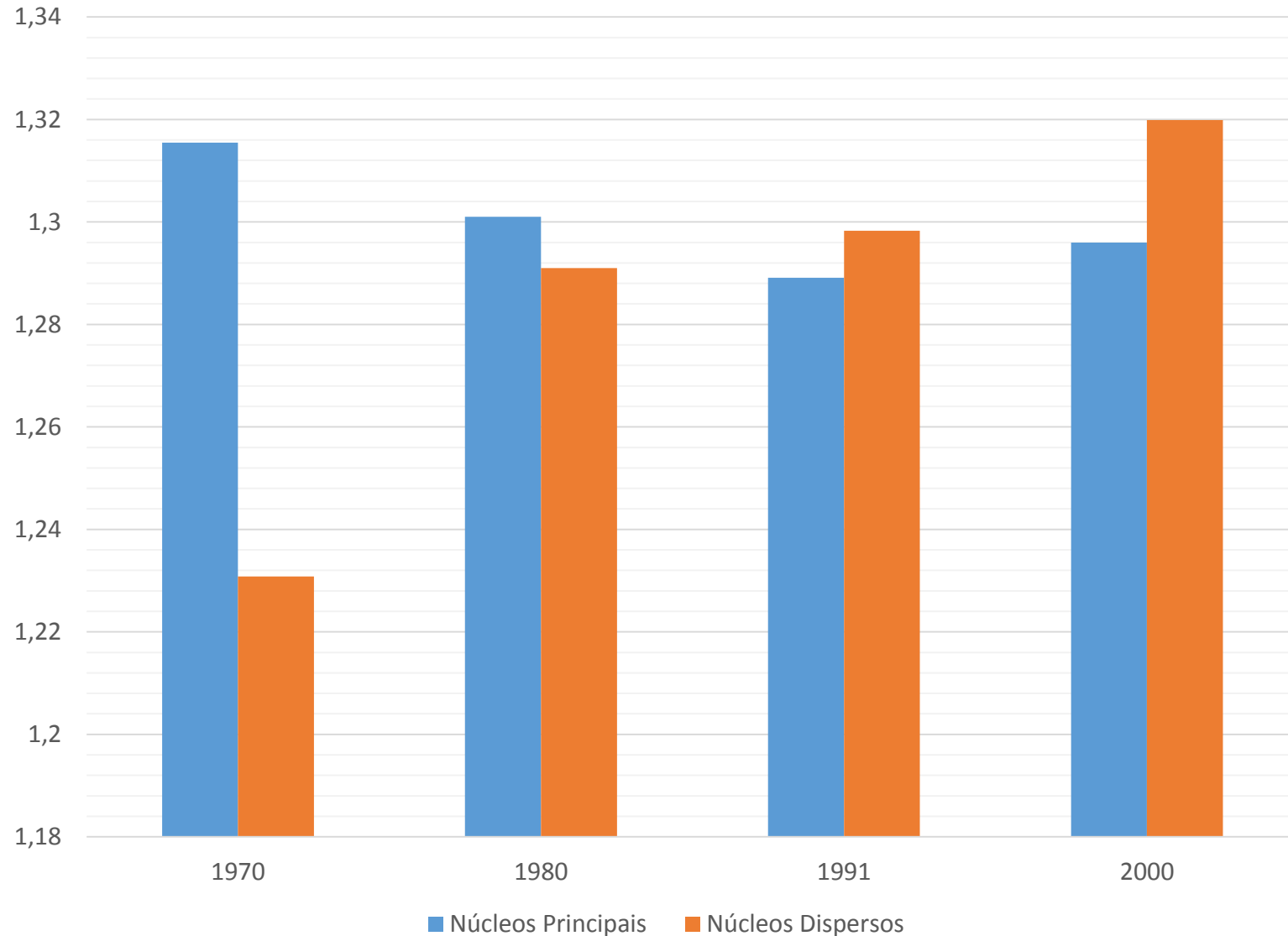
(P1) Area

$$AREA = a_{ij} \left(\frac{1}{10,000} \right)$$

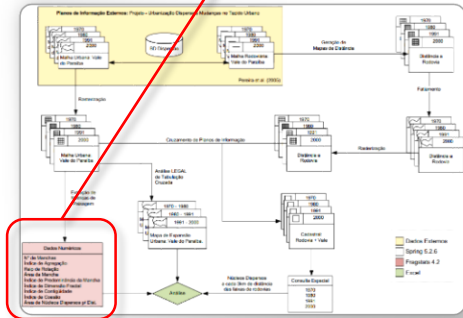
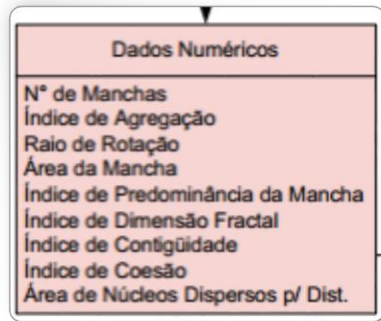
a_{ij} = area (m²) of patch ij.



COMPLEXIDADE DA MANCHA

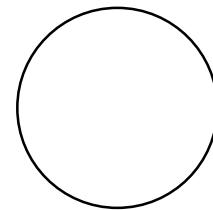


Fractal Dimension Index (Índice de Dimensão Fractal)



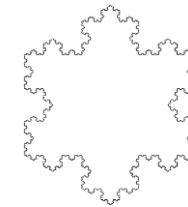
$$FRAC = \frac{2 \ln (0,25 p_{ij})}{\ln a_{ij}}$$

p_{ij} = perímetro em (m) da mancha ij .
 a_{ij} = área em (m²) da mancha ij .



Geometria euclidiana

$$1 \leq FRAC \leq 2$$



Geometria não-euclidiana

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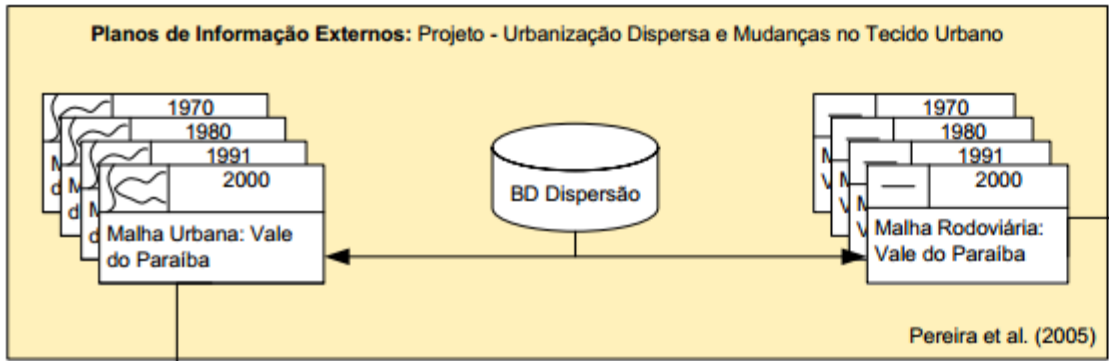
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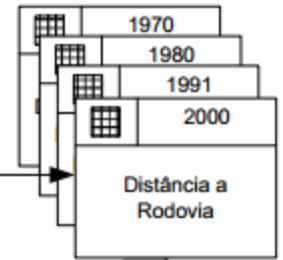
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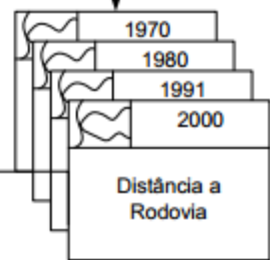
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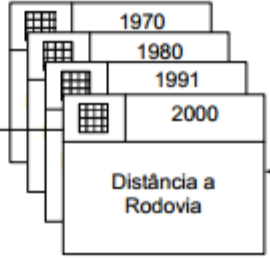
Geração de Mapas de Distância



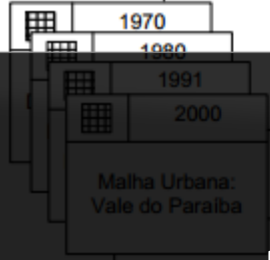
Fatiamento



Rasterização



Rasterização

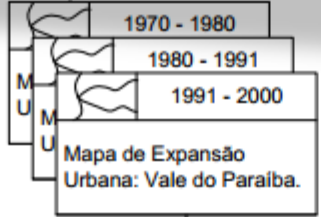


Obrigado!

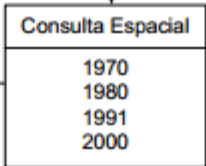
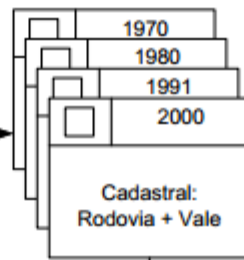
<dauidgmf@dsr.inpe.br>

Extração de Métricas de Paisagem

- Dados Numéricos**
- Nº de Manchas
 - Índice de Agregação
 - Raio de Rotação
 - Área da Mancha
 - Índice de Predominância da Mancha
 - Índice de Dimensão Fractal
 - Índice de Contigüidade
 - Índice de Coesão
 - Área de Núcleos Dispersos p/ Dist.



Núcleos Dispersos a cada 3km de distância das faixas de rodovias



- Dados Externos
- Spring 5.2.6
- Fragstats 4.2
- Excel