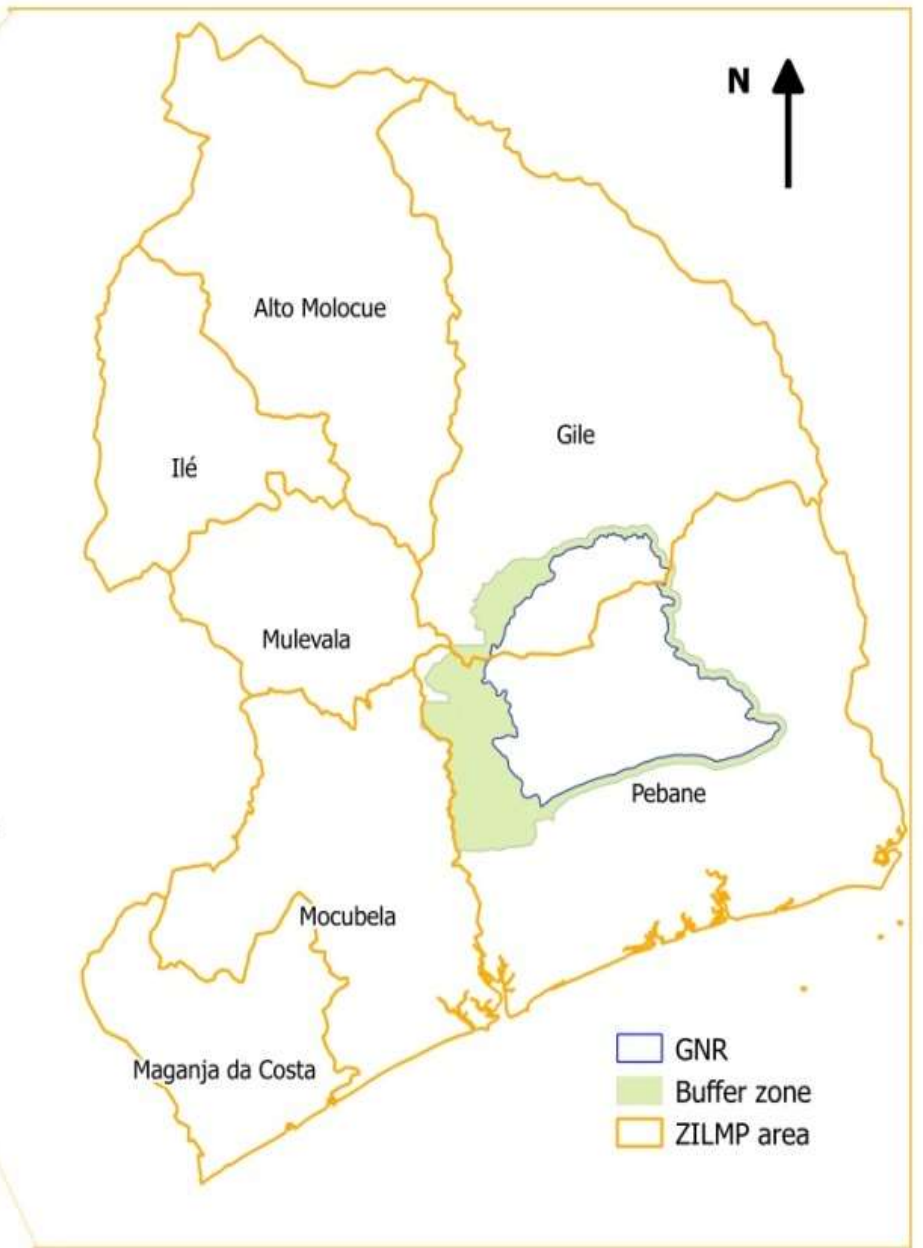
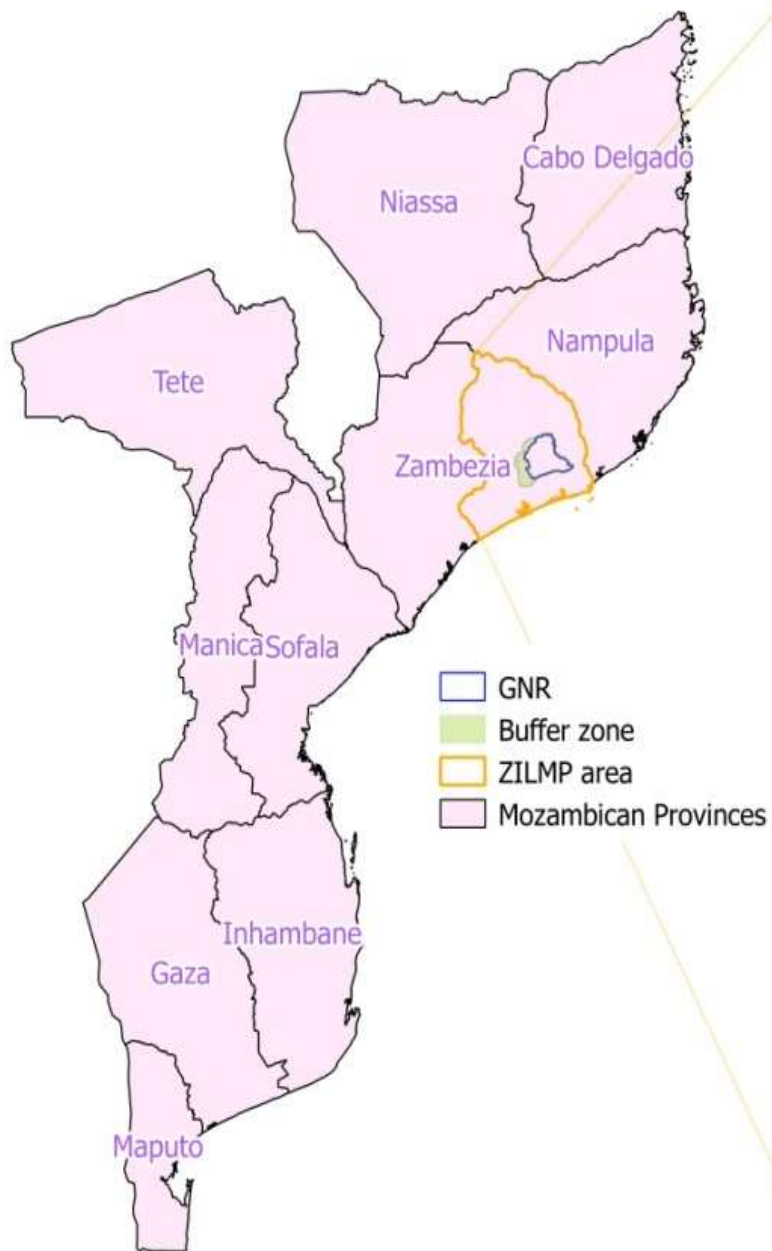


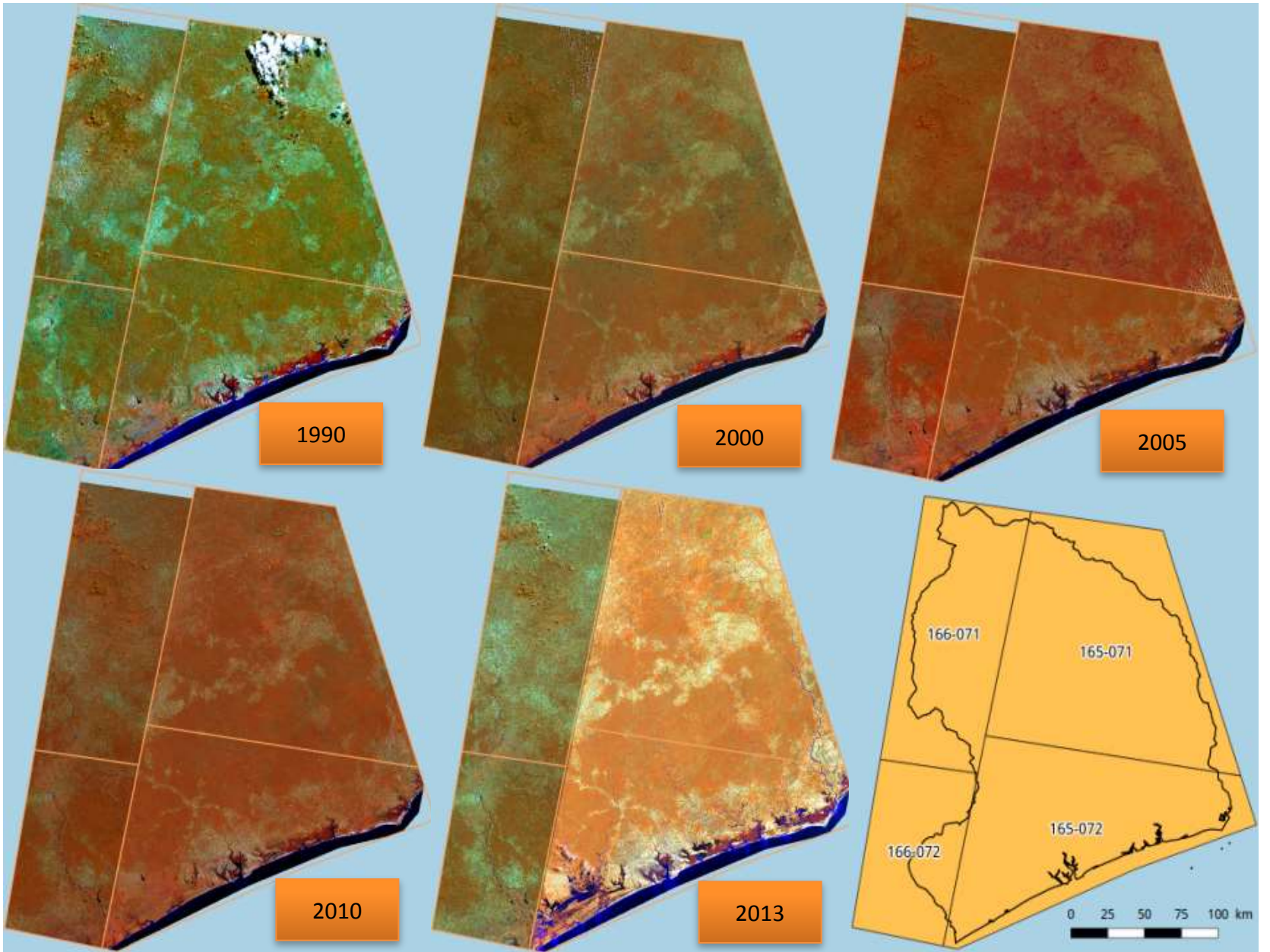
Zambézia Integrated Landscapes Management Program Estudo de base








	Área Distrital (ha)	Área Florestal 2013 (ha)	Porcentagem de Cobertura florestal
<i>Alto-Molocué</i>	630,812	227,596	36%
<i>Gilé</i>	896,516	543,366	61%
<i>Ilé</i>	303,411	90,147	30%
<i>Maganjada Costa</i>	267,925	94,134	35%
<i>Mocubela</i>	499,234	319,636	64%
<i>Mulevala</i>	261,685	126,358	48%
<i>Pebane</i>	1,005,479	582,546	58%
Total ZILMP	3,865,062	1,983,784	51%

HISTÓRICO DE DESMATAMENTO ENTRE 1990 E 2013



FOREST COVER CHANGES BETWEEN 1990 and 2013 in the ZILMP area

Legend

-  Gilé National Reserve (GNR)
-  GNR buffer zone
-  ZILMP area (7 districts around GNR)

Deforestation map from 1990 to 2013

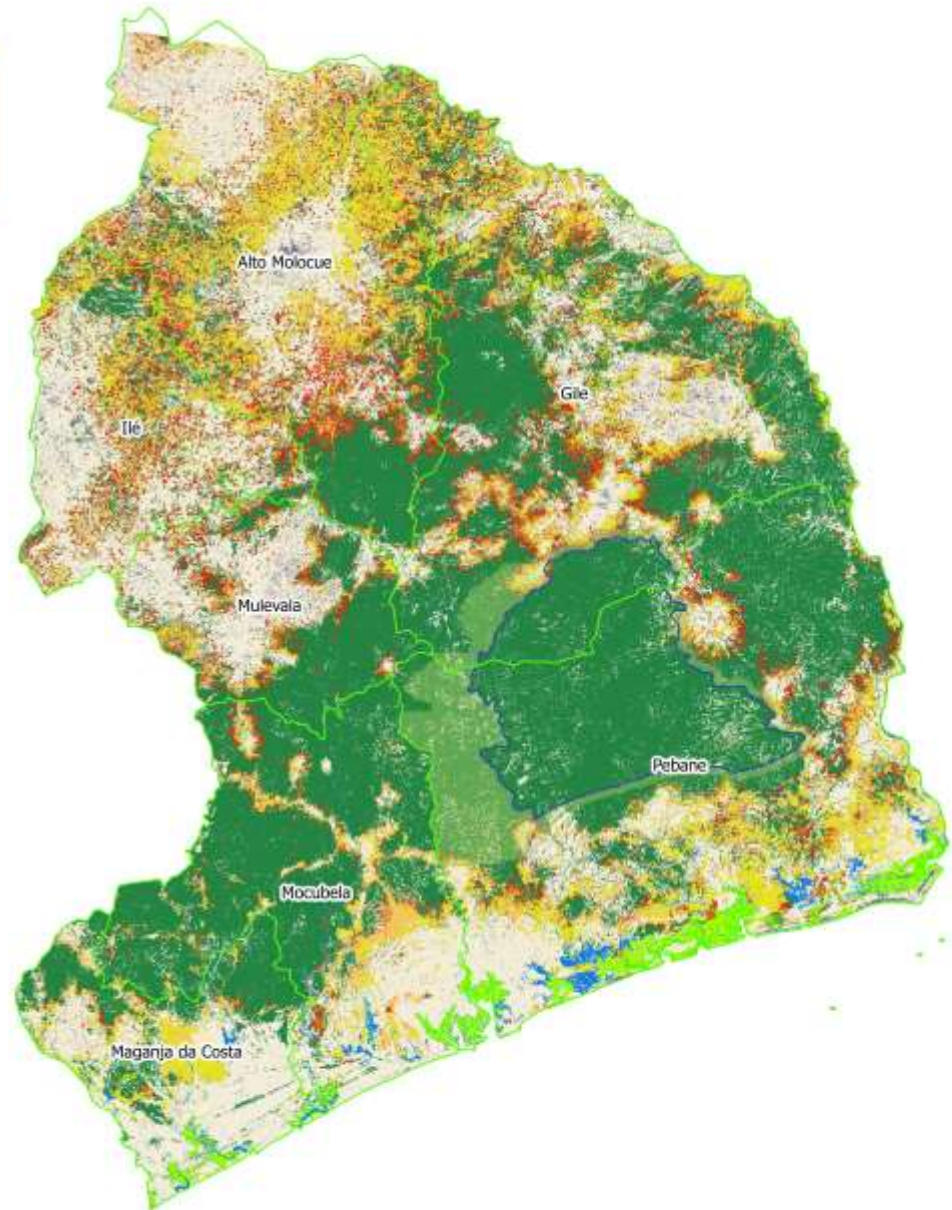
-  Forests in 2013
-  Mangroves
-  Deforestation between 2010 and 2013
-  Deforestation between 2005 and 2010
-  Deforestation between 2000 and 2005
-  Deforestation between 1990 and 2000
-  Other land use (non forest area)
-  Wetlands
-  Bare soil, rocks, sands, ...

0 25 50 75 km



Etc Terra


EtcLab, december 2015



	Área florestal [ha]					
	Floresta 1990	Floresta 2000	Floresta 2005	Floresta 2010	Floresta 2013	Perda Florestal 1990 2013
Alto-Molocué	309,071	274,574	259,960	248,594	227,596	-26%
Gilé	627,397	593,964	581,217	563,446	543,366	-13%
Ilé	114,000	105,797	102,624	98,573	90,147	-21%
Maganja da Costa	110,322	101,559	96,501	95,394	94,134	-15%
Mocubela	344,573	337,313	327,213	321,893	319,636	-7%
Mulevala	138,214	135,771	133,979	130,731	126,358	-9%
Pebane	650,001	621,058	603,705	591,930	582,546	-10%
Total IILMP	2,293,577	2,170,035	2,105,198	2,050,560	1,983,784	-14%
Reserva Nacional do Gilé	262,145	262,049	261,718	261,642	261,556	0%
Zona Tampão	128,241	127,062	125,831	124,159	122,917	-4%
RNG+RT	390,346	389,072	387,510	385,759	384,431	-2%
Mangais	53,361	53,353	53,353	53,349	53,348	0%

	Perda florestal anual [ha/ano]					
	1990-2000	2000-2005	2005-2010	2010-2013	1990-2013	2005-2013
Alto-Molocué	3,958.5	2,306.3	2,857.5	5,376.5	3,532.9	4,105.5
Gilé	3,311.5	2,139.9	3,739.2	5,268.5	3,413.6	4,419.8
Ilé	1,127.2	468.9	1,330.3	2,096.6	1,129.2	1,766.3
Maganja da Costa	931.4	916.4	273.3	320.0	707.5	296.3
Mocubela	703.5	1,985.9	1,106.8	585.9	1,037.2	875.1
Mulevala	261.4	301.8	752.6	1,127.9	503.5	930.2
Pebane	2,757.8	3,255.4	2,360.5	2,462.3	2,740.0	2,404.6

Total ZILMP	13,051.4	11,374.6	12,420.2	17,237.6	13,063.8	14,797.7
-------------	----------	----------	----------	----------	----------	----------

	Perda florestal anual [ha/ano]					
	1990-2000	2000-2005	2005-2010	2010-2013	1990-2013	2005-2013
Reserva Nacional do Gilé	9.2	60.5	15.4	22.6	23.9	18.5

Zona Tampão	111.6	236.6	331.7	326.0	216.3	329.2
-------------	-------	-------	-------	-------	-------	-------

RNG-ZT	121.9	290.1	352.1	348.6	240.3	350.6
--------	-------	-------	-------	-------	-------	-------

Mangais	0.7	0	0.8	0.2	0.5	0.5
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**Forest cover change
between 1990 and 2013
in Alto Molocué district**



Legend

District

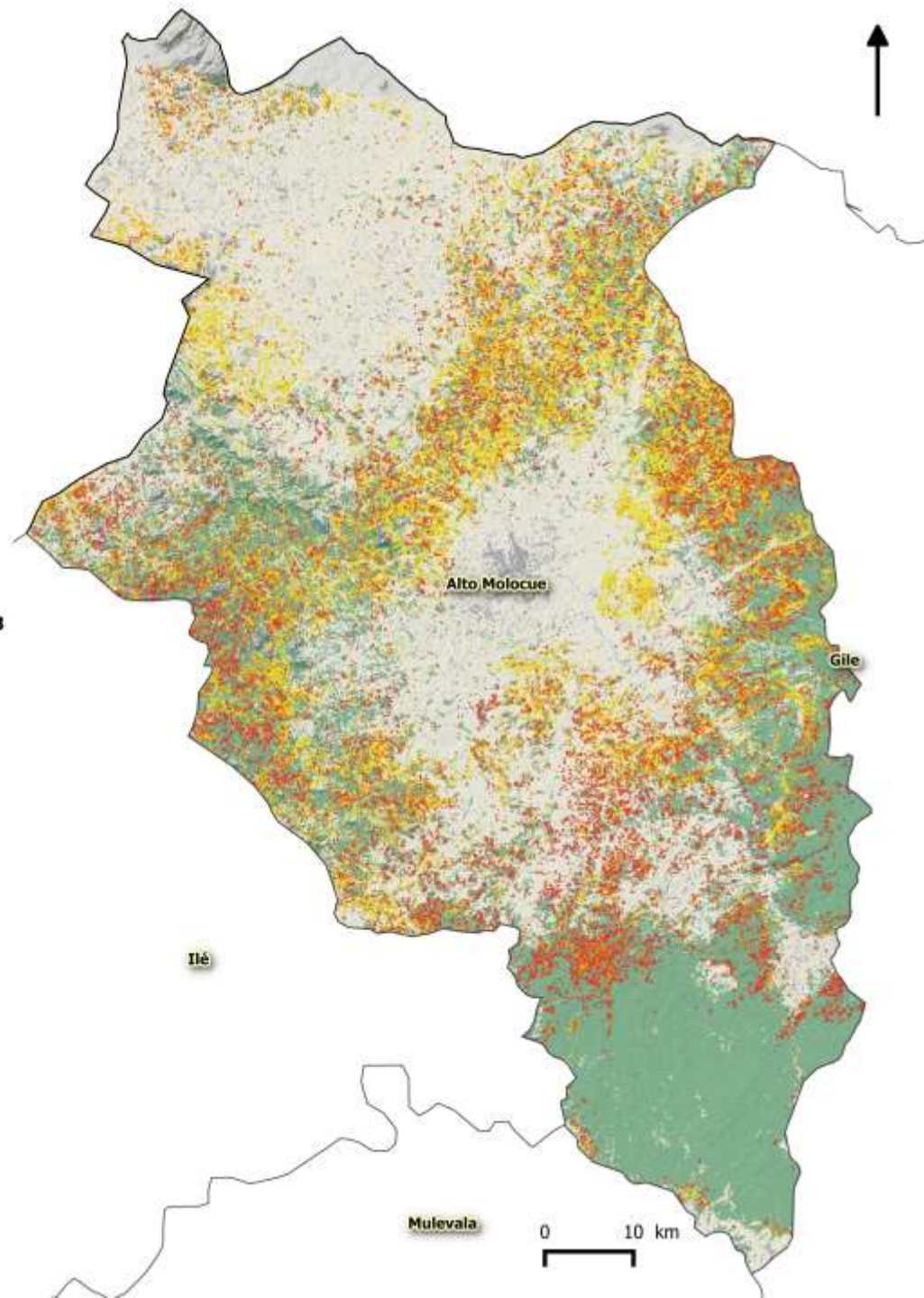
□ Alto Molocué

Deforestation map from 1990 to 2013

- Forests in 2013
- Mangroves
- Deforestation between 2010 to 2013
- Deforestation between 2005 to 2010
- Deforestation between 2000 to 2005
- Deforestation between 1990 to 2000
- Other land use (non forest area)
- Wetlands
- Bar soil, rocks, sands



Copyright : Etc Terra



**Forest cover change
between 1990 and 2013
in Gilé district**



Legend

District

□ Gilé

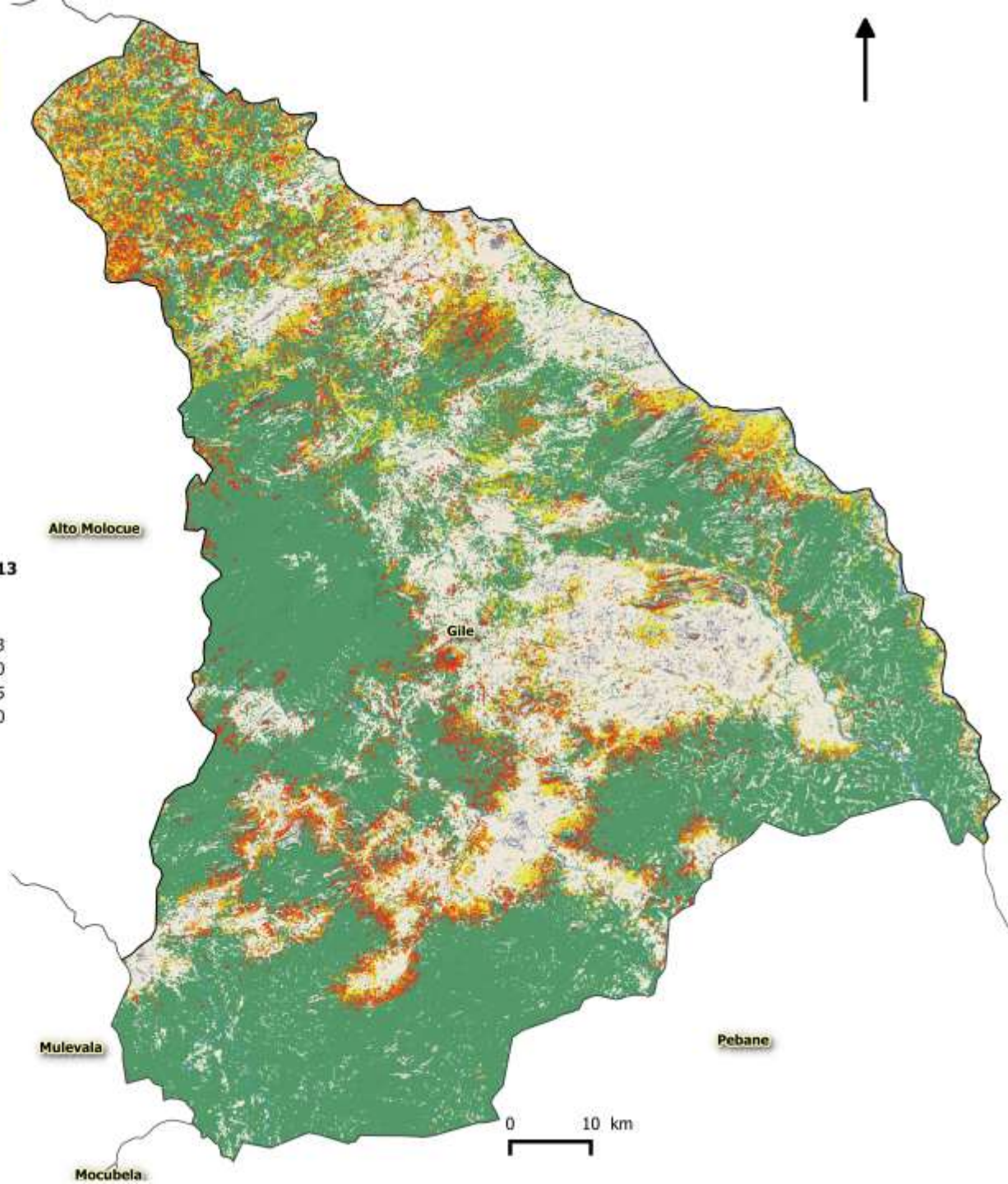
Deforestation map from 1990 to 2013

- Forests in 2013
- Mangroves
- Deforestation between 2010 to 2013
- Deforestation between 2005 to 2010
- Deforestation between 2000 to 2005
- Deforestation between 1990 to 2000
- Other land use (non forest area)
- Wetlands
- Bar soil, rocks, sands

Etc Terra



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**Forest cover change
between 1990 and 2013
in Pebane district**



je
Gile
evala

Legend

District

□ Pebane

Deforestation map from 1990 to 2013

- Forests in 2013
- Mangroves
- Deforestation between 2010 to 2013
- Deforestation between 2005 to 2010
- Deforestation between 2000 to 2005
- Deforestation between 1990 to 2000
- Other land use (non forest area)
- Wetlands
- Bar soil, rocks, sands

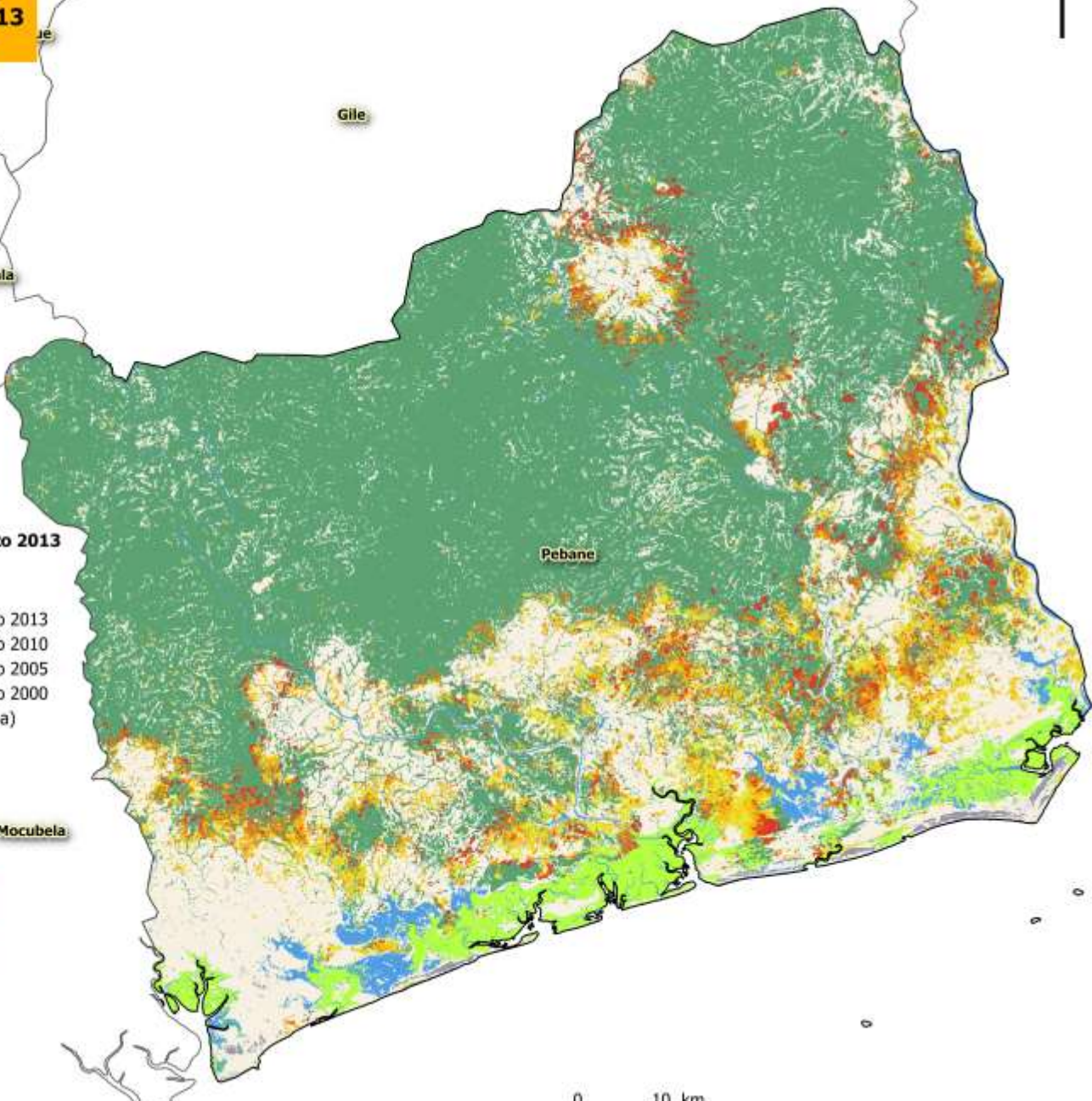
Mocubela

Etc Terra



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0 10 km



**Forest cover change
between 1990 and 2013
in Mocubela district**



Legend

District

□ Mocubela

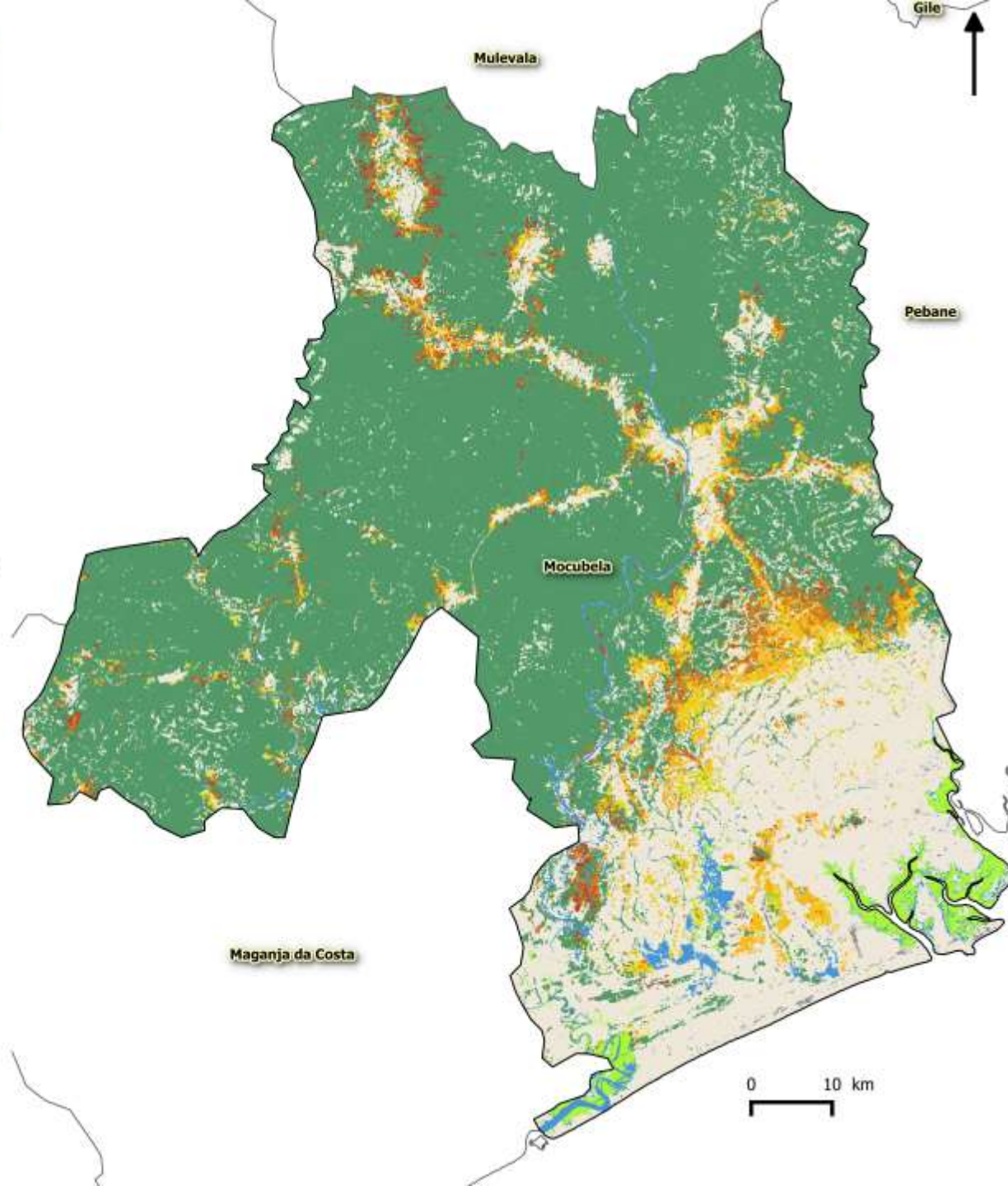
Deforestation map from 1990 to 2013

- Forests in 2013
- Mangroves
- Deforestation between 2010 to 2013
- Deforestation between 2005 to 2010
- Deforestation between 2000 to 2005
- Deforestation between 1990 to 2000
- Other land use (non forest area)
- Wetlands
- Bar soil, rocks, sands

Etc Terra



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**Forest cover change
between 1990 and 2013
in Maganja da costa
district**



Legend

District

□ Maganja da costa

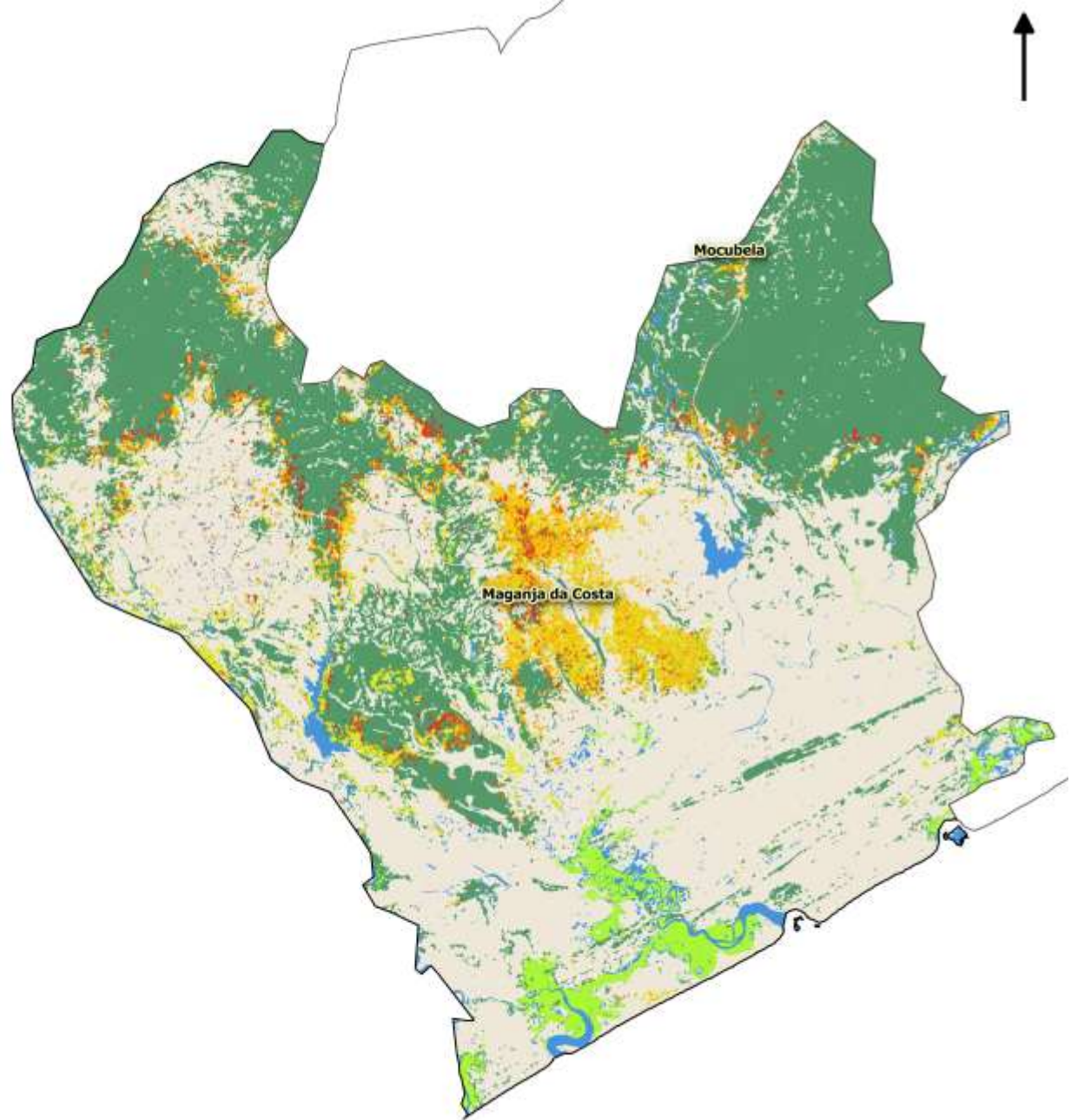
Deforestation map from 1990 to 2013

- Forests in 2013
- Mangroves
- Deforestation between 2010 to 2013
- Deforestation between 2005 to 2010
- Deforestation between 2000 to 2005
- Deforestation between 1990 to 2000
- Other land use (non forest area)
- Wetlands
- Bar soil, rocks, sands

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0 10 km

**Forest cover change
between 1990 and 2013
in Mulevala district**



Legend

District

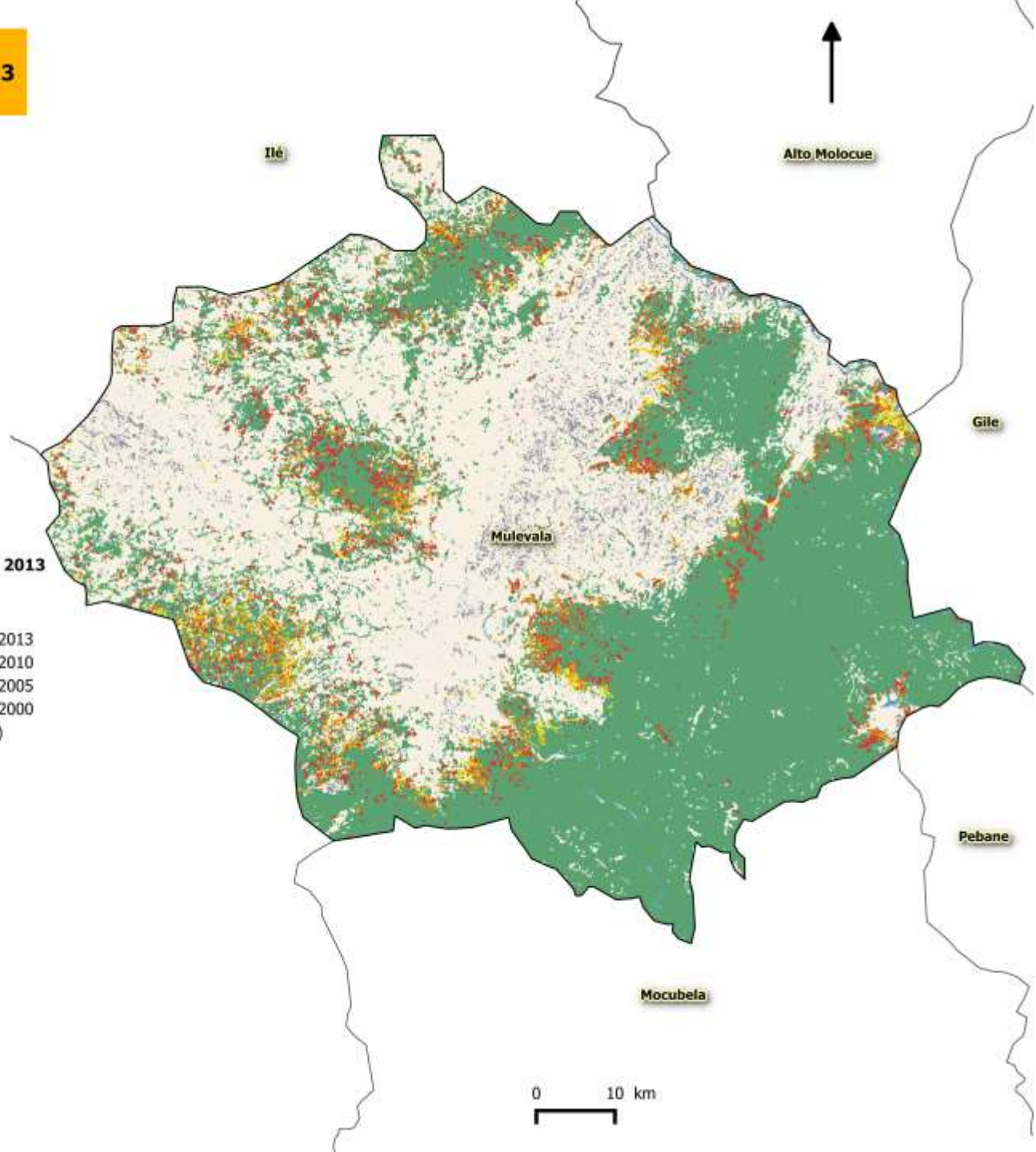
□ Mulevala

Deforestation map from 1990 to 2013

- Forests in 2013
- Mangroves
- Deforestation between 2010 to 2013
- Deforestation between 2005 to 2010
- Deforestation between 2000 to 2005
- Deforestation between 1990 to 2000
- Other land use (non forest area)
- Wetlands
- Bar soil, rocks, sands



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0 10 km

**Forest cover change
between 1990 and 2013
in Ilé district**



Legend

District

□ Ilé

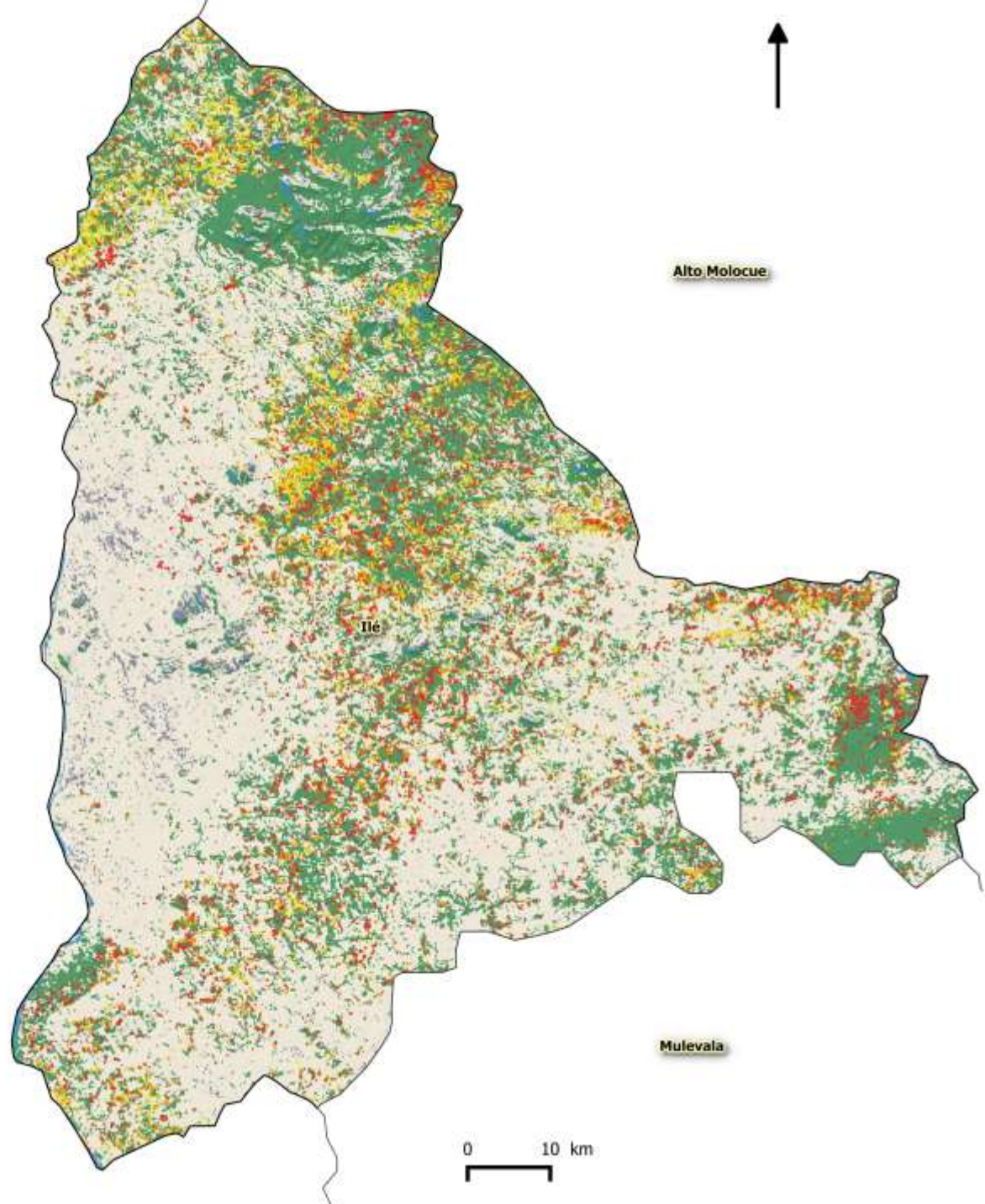
Deforestation map from 1990 to 2013

- Forests in 2013
- Mangroves
- Deforestation between 2010 to 2013
- Deforestation between 2005 to 2010
- Deforestation between 2000 to 2005
- Deforestation between 1990 to 2000
- Other land use (non forest area)
- Wetlands
- Bar soil, rocks, sands

Etc Terra



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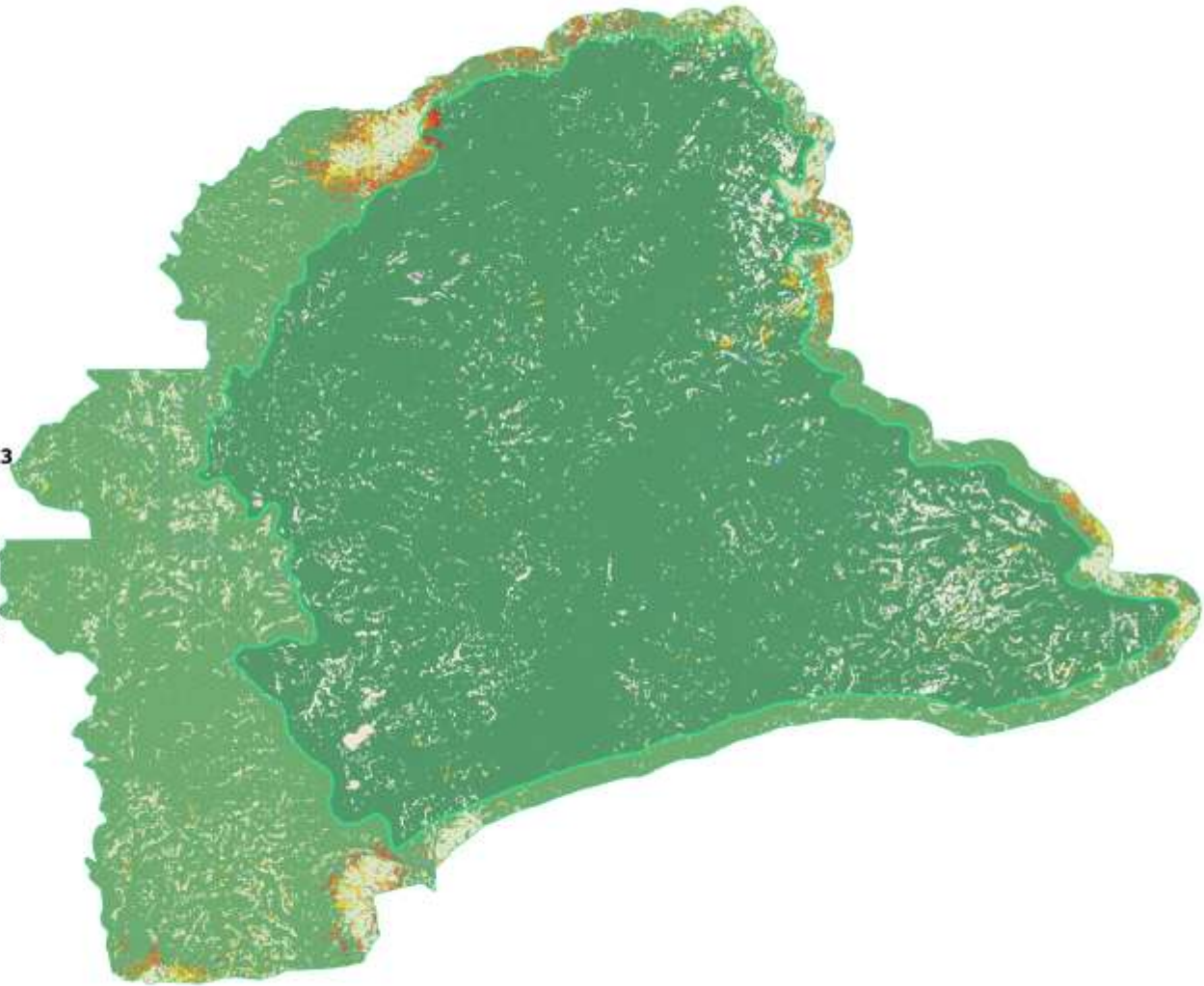


Forest cover change between 1990 and 2013 in Gilé National Reserve and its buffer zone

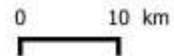


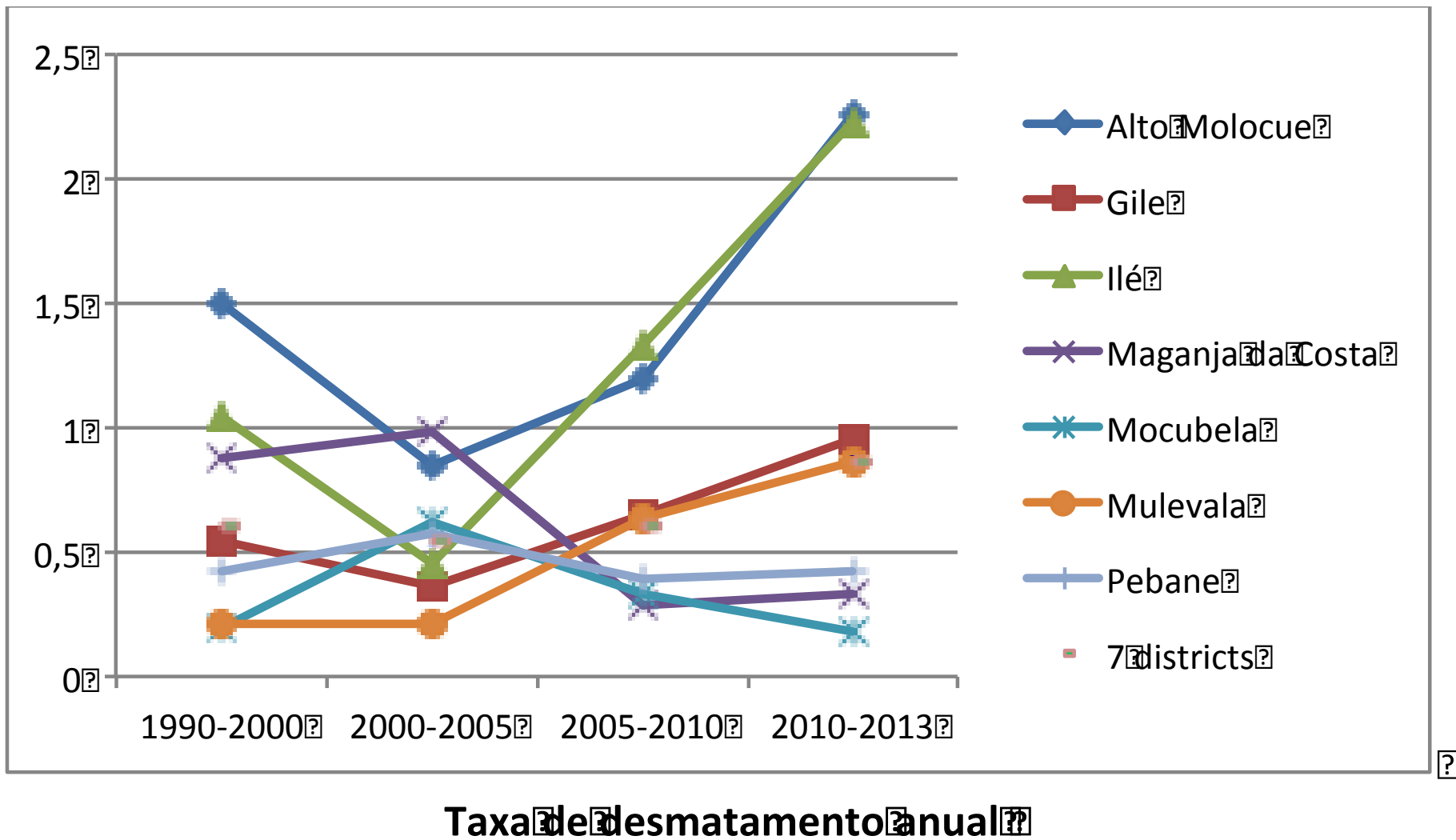
Legend

- Buffer zone around GNR
- Gilé National Reserve (GNR)
- Deforestation map from 1990 to 2013**
- Forests in 2013
- Mangroves
- Deforestation between 2010 to 2013
- Deforestation between 2005 to 2010
- Deforestation between 2000 to 2005
- Deforestation between 1990 to 2000
- Other land use (non forest area)
- Wetlands
- Bar soil, rocks, sands



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LINHA DE BASE DAS EMISSOES DE CARBONO

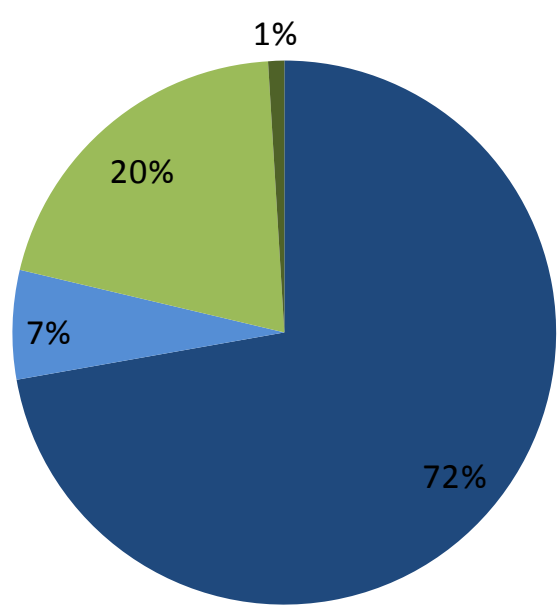
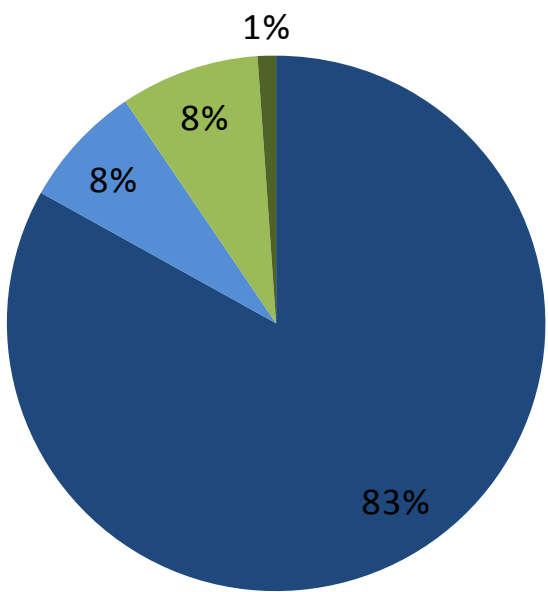
	Aboveground	Belowground	Total
Carbon stocks in tC/ha			
Average	63.2	17.9	81.1
Standard deviation	31.8	8.7	40.5
90% CI	6.4	1.7	8.2
Carbon stocks in tCO₂eq/ha			
Average	228.4	65.7	297.5
Standard deviation	119.3	31.7	148.3
90% CI	24.1	6.4	29.9

	Carbon stocks in tC/ha		
	Above ground (from McNicol et al., 2011)	Estimation of below ground with root-to-shoot ratio	Total
Savannah	11.5	6.4	17.9
Crops	9.4	5.3	14.7
Average	10.45	5.9	16.3
Emission factors in tCO₂eq/ha			
	Aboveground	Belowground	Total
	190.0	44.1	237.7

Emissions due to deforestation

Periods	Mean historical (2005-2013) deforestation area - ha	Emissions related to aboveground biomass - tCO ₂ eq	Emissions related to belowground biomass - tCO ₂ eq	Total baseline program emissions - tCO ₂ eq	
Historical reference period	2005	12,420	2,360,386	54,733	2,415,119
	2006	12,420	2,360,386	109,467	2,469,853
	2007	12,420	2,360,386	164,200	2,524,586
	2008	12,420	2,360,386	218,934	2,579,320
	2009	12,420	2,360,386	273,667	2,634,053
	2010	17,238	3,275,905	455,776	3,731,681
	2011	17,238	3,275,905	531,739	3,807,644
	2012	17,238	3,275,905	607,702	3,883,607
	2013	17,238	3,275,905	683,665	3,959,569
Baseline period	2014	14,798			3,111,715
	2015	14,798			3,111,715
	2016	14,798			3,111,715
	2017	14,798			3,111,715
	2018	14,798			3,111,715
	2019	14,798			3,111,715
	2020	14,798			3,111,715
	2021	14,798			3,111,715
	2022	14,798			3,111,715
	2023	14,798			3,111,715
	2024	14,798			3,111,715

CAUSAS DE DESMATAMENTO E DEGRADAÇÃO FLORESTAL

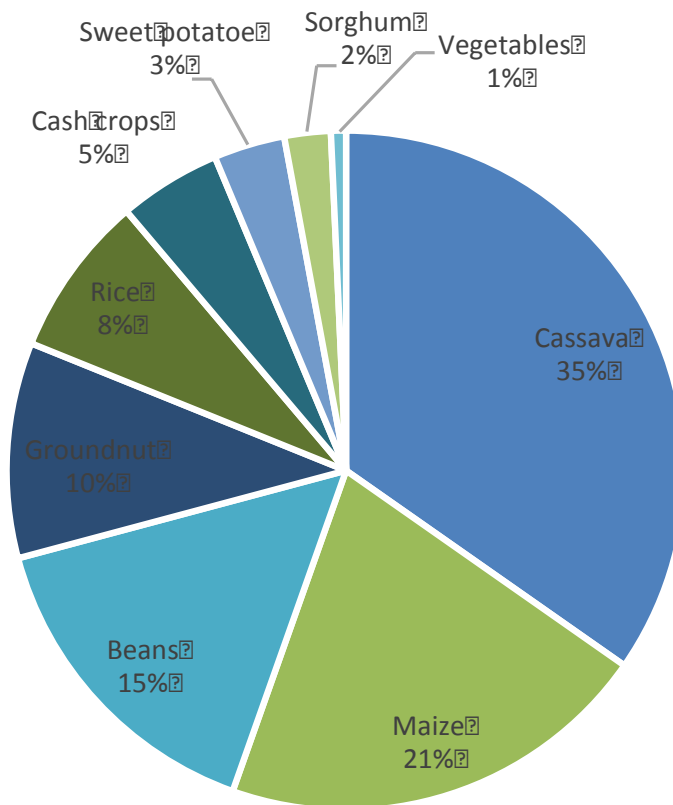


- Desmatamento por agricultura de pequena escala
- Desmatamento por uma mistura carvão - agricultura
- Degradação por carvão
- Degradação por exploração florestal

Fontes de emissões de carbono na ZILMP

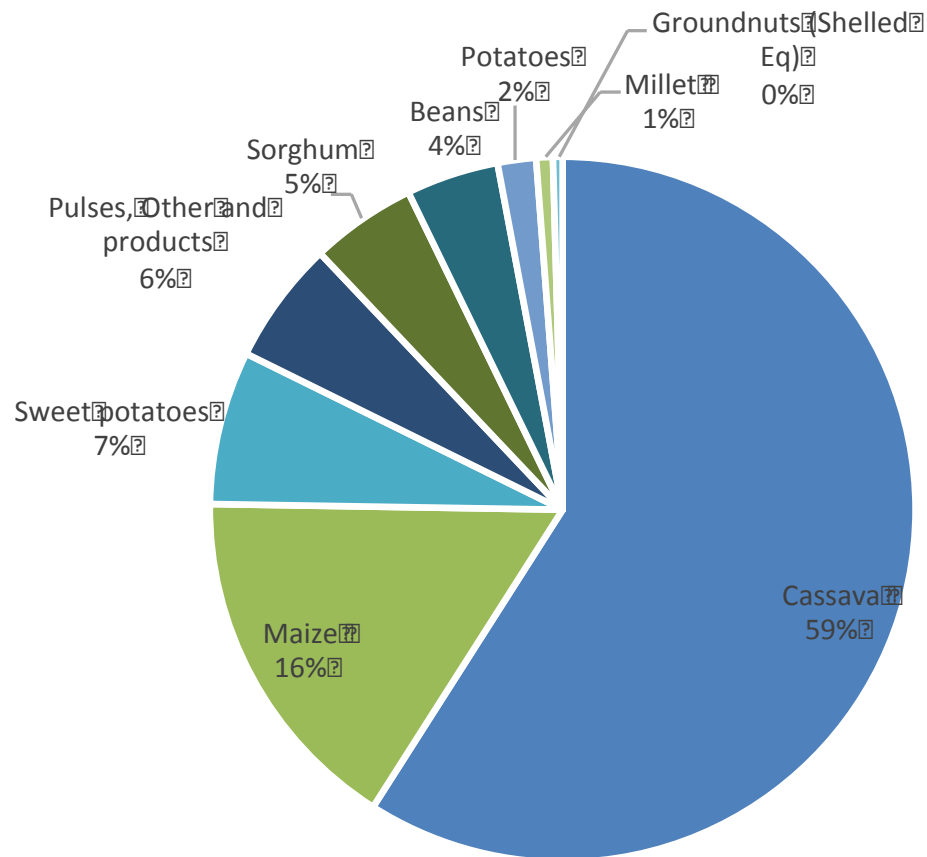


AGRICULTURA



Breakdown of surfaces by crop in 2014 in the ZILMP area. Source: SDAE

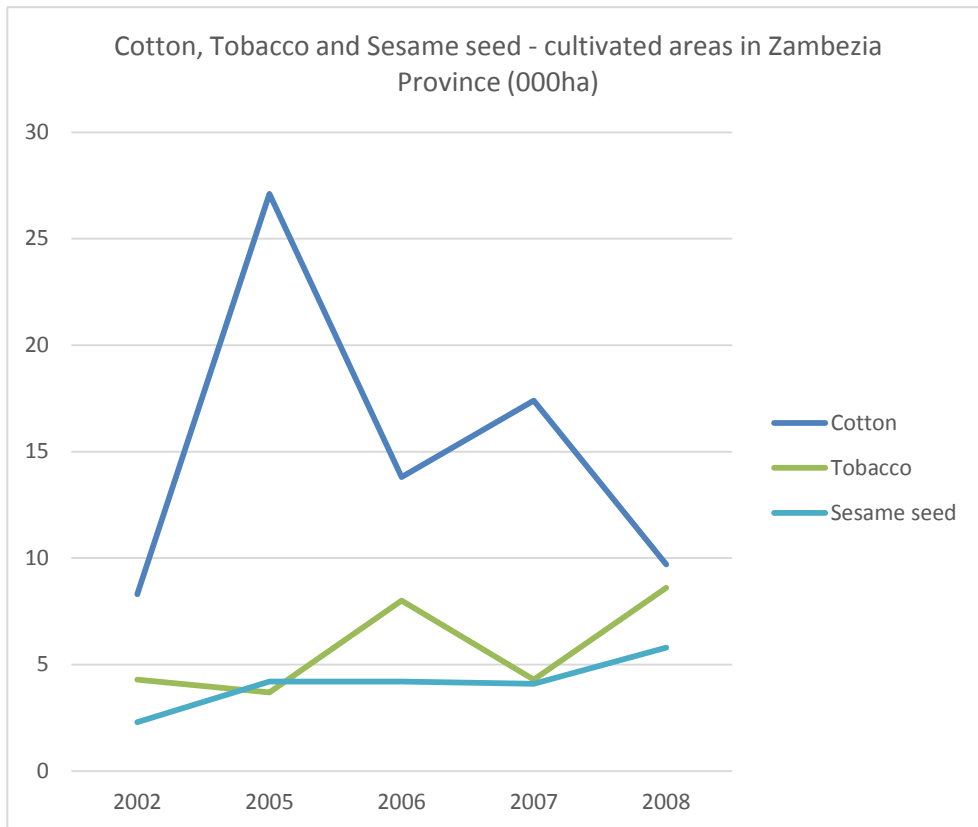
Área agrícola: 514,722 ha



Breakdown of surfaces by crop in 2014 in the ZILMP Area. Source: Rongead & Etc Terra

Área agrícola: 537,970 ha

- O casal 'milho – mandioca' está no coração do sistema de produção da ZILMP
- **No tem acesso a inputs externos: mecanização, tração animal, fertilizantes...**
- Onde trabalho está mas limitado do que a terra, extensificação é a estratégia mais racional
- Intensificação acontece só nas zonas de população densa onde já não tem mais floresta



- ⇒ **Hoje, as culturas de rendimento não são causa de desmatamento na zona ZILMP**
- ⇒ **Os mercados do algodão e do tabaco não são favoráveis**
- ⇒ **Algumas culturas de rendimento poderiam ajudar a aumentar os rendimentos**

	Total prod (tons)	Total area (ha)
Cash Crops		
Sesame seed	10,075	11,674
Tobacco	2,888	1,925
Cotton	215	1,430

Área de culturas de rendimento na zona ZILMP, 2014

PRODUÇÃO DE CARVÃO

Consumo de carvão nas aldeias da zona ZILMP

	Gilé	Pebane	Maganja da Costa	Alto Molocué	Ilé	Total
Number of inhabitants	21,969	22,535	13,438	37,437	15,570	110,949
Percentage of charcoal consumers in the city population	74%	63%	86%	93%	90%	
Mean number of bags consumed per month per households	2.8	2.6	2.6	2.4	2.7	
Equivalent tons per year	3,707	3,684	3,036	7,634	3,363	21,424
Consumption of charcoal in t/year/household	1.5	1.6	1.7	1.3	1.4	

?

Produção de carvão na zona ZILMP

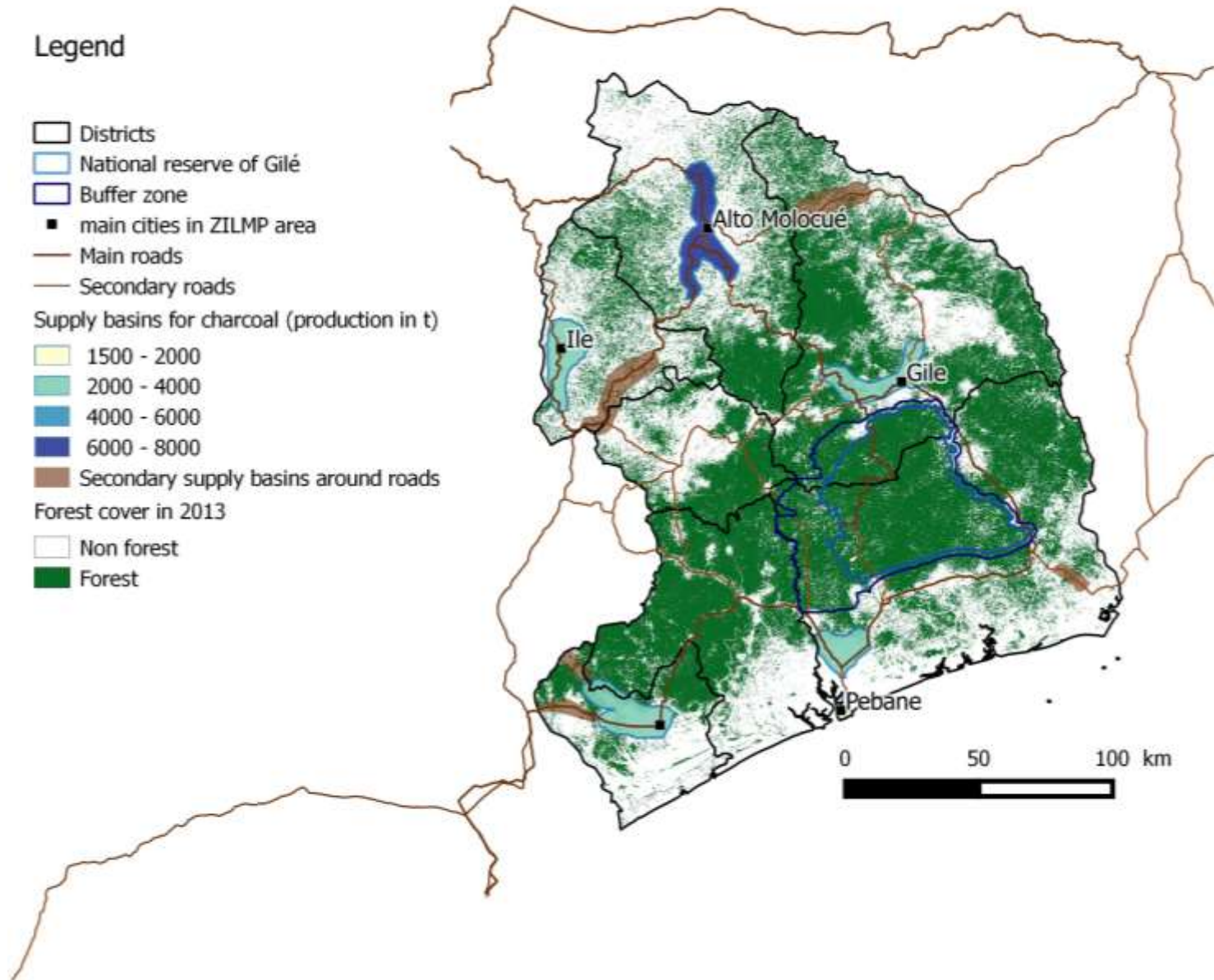
Urban centers sampled in the districts	Gilé	Pebane from the Miombo forest	Pebane from mangroves	Maganja da Costa	Alto Molocué	Ilé	Average
Radius of the supply basin in km	22	17	3	17	29	17	22
Estimates of the number of producers working in the supply basin	580	185	98	401	930	729	487
Mean number of kilns per producer per month	19	18	29	11	29	22	21
Mean length of kilns in m	3.3	6.2	5.6	5.5	5.2	4.3	5.4
Mean percentage of kilns done with trees from slash and burn agriculture per producer per month	12%	10%	1%	8%	17%	8%	10%
Equivalent of the area of forest impacted (degradation or deforestation) in ha/year	2,131	601	544	747	4,382	2,909	1,886

?

A produção de carvão impacta 10,770 ha de floresta de Miombo por ano na zona ZILMP

Legend

-  Districts
-  National reserve of Gilé
-  Buffer zone
-  main cities in ZILMP area
-  Main roads
-  Secondary roads
- Supply basins for charcoal (production in t)
 -  1500 - 2000
 -  2000 - 4000
 -  4000 - 6000
 -  6000 - 8000
-  Secondary supply basins around roads
- Forest cover in 2013
 -  Non forest
 -  Forest



Total deforestation in the supply basins in comparison to deforestation rate in the program area

Data on areas	Program area		Supply basins	
	Areas in ha	Annual deforestation rate	Areas in ha	Annual deforestation rate
Total area	3,865,062	??	173,303	??
Forest cover 2013	1,983,784	??	38,244	??
Historical deforestation				
2010-2013	66,777	-0.86%	3,171	-2.05%
2005-2010	54,637	-0.61%	3,525	-1.93%
2000-2005	64,838	-0.55%	5,393	-2.04%
1990-2000	123,541	-0.60%	9,771	-1.95%
Mangroves	53,348	??	252	??
Other areas	1,518,137	??	112,947	??

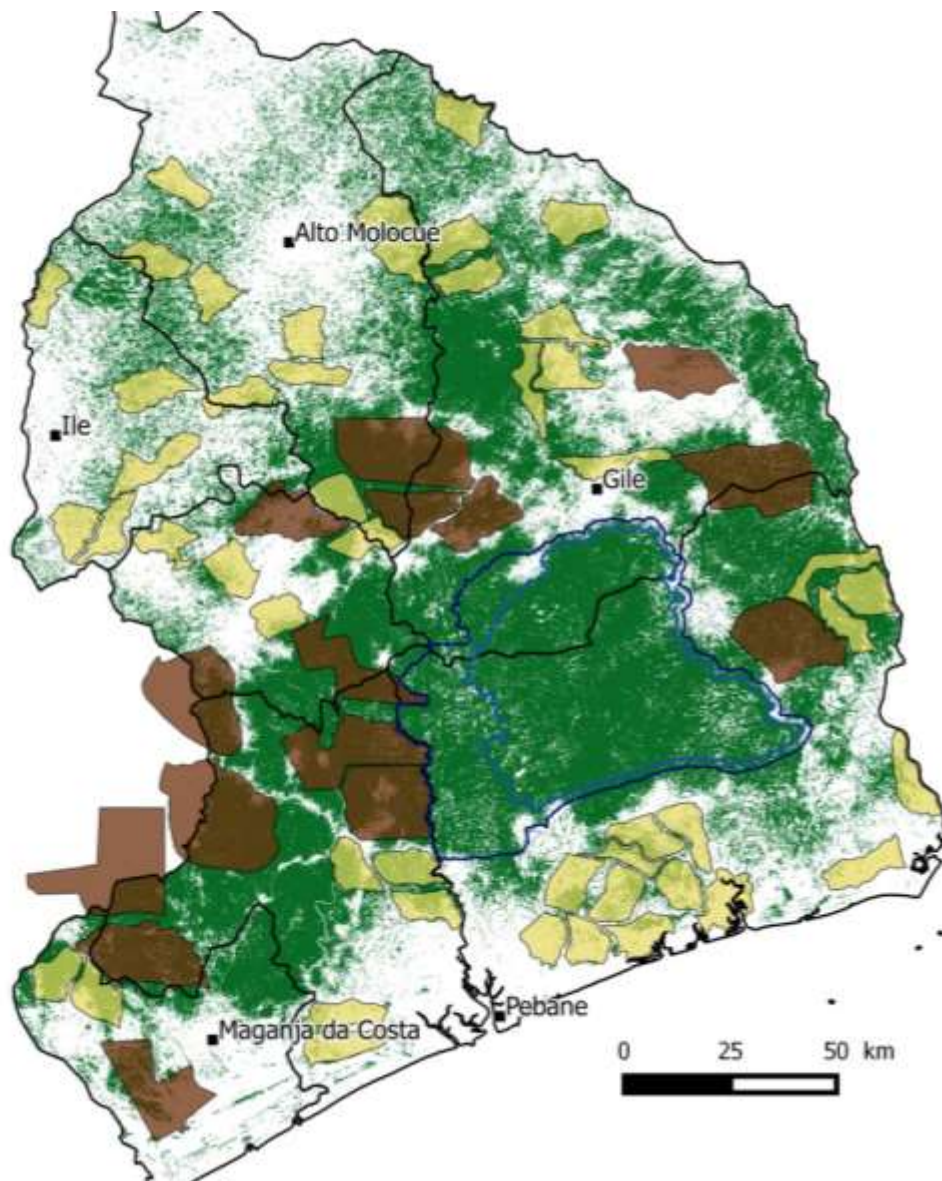
?

- Emissões devidas a produção de carvão: de 288,343 até 876,274 tCO₂eq/ano; 9% até 25% das emissões devidas a desmatamento
- => **Temos de considerar** emissões devidas a produção de carvão

EXPLORAÇÃO FLORESTAL

Legend

- main cities in ZILMP area
- Districts
- National reserve of Gilé
- buffer zone
- concessions 2015
- operational simple licences 2015
- operational forest cover
- non forest
- forest in 2013



Proportion of forests in the program area that was under concession or simple license status in 2011 and corresponding deforestation rate during the recent period 2010-2013

Land cover classes	ZILMP	Areas under concessions in 2011 in ha	Areas under simple licenses in 2011 in ha
Total area	3,865,062	1,200,120	157,794
Proportion of the ZILMP area	100%	31%	4%
Forest cover in 2013	1,983,784	841,332	82,829
Proportion of the forest	100%	42%	4%
Historical deforestation rate between 2010-2013	-0.86%	-0.76%	-1.12%

?

- Emissões devidas a exploração florestal são de 0.04 MtCO₂eq/ano
 - Representam só 1.2% das emissões devidas a desmatamento
- => Não é preciso contar essas emissões**

RIESGOS DE DESMATAMENTO NO FUTURO

**OPÇÕES PARA REDUZIR O
DESMATAMENTO E A DEGRADAÇÃO
FLORESTAL**

- **A transformação das práticas de produção de milho e mandioca deveria ser o coração das ações para reduzir emissões**
- Será muito difícil !!
- Fertilização mineral, pesticidas e introdução de pecuário não são opções viáveis
- **Agricultura de conservação parece a única solução**

Uma questão chave: **Como facilitar a adoção a grande escala da agricultura de conservação?**

- As práticas alternativas apoiadas devem ser adaptadas as estratégias dos produtores
- Apoio direto aos produtores por parte duma grande equipa de extensionistas
- Atividades para aumentar o retorno das culturas de rendimento (gergelim e castanha) para facilitar o investimento
- Um abordagem que vincularia aumento do rendimento da castanha e do gergelim e intensificação do milho e cassava ajudaria muito

Table 1: Main characteristics of the proposed options

Types of Activity	Method of implementation	Means of implementation	Type of research-action needed	Potential partnership
Agro-ecology Intensification for subsistence crops	<p>Double differentiation according to:</p> <ul style="list-style-type: none"> • Agro-ecological context • Individual households' strategies 	<ul style="list-style-type: none"> - Strong & regular field presence - Differentiated protocols implemented by committed & highly qualified extension agents 	<ul style="list-style-type: none"> - Experimentation in smallholders' environment - Understanding of smallholders' expertise 	<ul style="list-style-type: none"> - Structures that are already working in the area with rural households (public, NGO or private) with result-based payments and acceptance of the implementation method
Increasing smallholders' revenues, including through no-deforestation value chains	<p>Large scale extension with a common package</p>	<ul style="list-style-type: none"> - Initial training (2 or 3 modules) and support during the commercialization period - Possible use of ICT -Need for market analysts 	<ul style="list-style-type: none"> - Local and international demand integration - Market analysis 	<ul style="list-style-type: none"> - Up & downstream private sector: <ul style="list-style-type: none"> • Upstream: input supply for increased productivity • Downstream: commitment from local and international buyers for sustainable and fair commodities

	Technical feasibility	Social feasibility	Economic feasibility	Deforestation and forest degradation mitigation potential	Extension models	Conclusion
Agro-ecology intensification and increased revenue through cash crops						
Support to agro-ecology intensification, mainly on maize and cassava crops	The main “good practices” are known, but need modulation according to smallholders and <i>in-situ</i> test	Agro-ecology practices to be proposed should be low-labor intensive	Need to be based on low cost inputs	High, as maize and cassava almost are the unique drivers of deforestation	Individual support Small number of smallholders per extension agents Well trained extension agents needed	First priority Budget Consuming

	Technical feasibility	Social feasibility	Economic feasibility	Deforestation and forest degradation mitigation potential	Extension models	Conclusion
Increasing smallholders income						
Support cash crops production	Main focus on cashew (3/7 districts) and sesame seed (4/7). Second focus on beans and groundnuts	Annual cash crop: Easy to Implement Cashew: more intensive training needed	Should increase income but depends on world market prices	Indirect, as increased incomes ease the endorsement of good practices	Standardized extension is possible	Priority Moderately budget consuming
Support crops marketing	Focus on sesame and cashew	Important need to improve smallholders' marketing skills	Will increase smallholders' income	Indirect, as increased incomes ease the endorsement of good practices	Standardized extension is possible. Use of ICT (SMS)	Priority Low budget consuming
Promote no-deforestation value chains	Focus on sesame and cashew Need to elaborate a balanced contract farming scheme		Need for long-term involvement of an international buyer	High Allow to link increased income to agro-ecology intensification	Mix of standardized and personalized extension model	Priority

	Technical feasibility	Social feasibility	Economic feasibility	Deforestation and forest degradation mitigation potential	Extension models	Conclusion
Increasing smallholders income						
Post-harvesting value-added	Depends on commodity. See below for some examples			Indirect, as increased incomes ease the endorsement of good practices		Priority. Through a call for proposal for micro-project
<i>Cashew</i>			Cashew: small scale processing is not sustainable			
<i>Cassava</i>	Limited options for processing (high quality cassava flour)		Low local demand for processed cassava			
<i>Mango</i>	Fresh mango: need for high logistical skills Dried mango: Easy to Implement		Fresh mango: Highly competitive international market Dried mango: over supplied international market			No call for proposal (From the ER-PIN)

	Technical feasibility	Social feasibility	Economic feasibility	Deforestation and forest degradation mitigation potential	Extension models	Conclusion
Increasing smallholders income						
Agricultural land development	Focus on highly deforested district (Ilé & Alto-Molocé)	Labor constraints should be assessed	Need to be based on low cost inputs	Medium All land intensification		Priority. Through a call for proposal for micro-project
Infrastructure and logistics for storage	No particular needs in storage infrastructure					Not a priority (From the ER-PIN)

	Technical feasibility	Social feasibility	Economic feasibility	Deforestation and forest degradation mitigation potential	Extension models	Conclusion
Improved kilns for charcoal production						
Training of charcoal producer groups for the construction of improved kilns	Current techniques to be assessed and creation of a training manual	Monitoring time need to be low	Need to be based on low investments – kilns will continue to be made from soil	Low – Medium Yields will only be slightly improved Improvement of charcoal producers' revenues	Group of proximity trainers – specialists in carbonization techniques	Medium priority Highly demanding on human resources for training and monitoring

	Technical feasibility	Social feasibility	Economic feasibility	Deforestation and forest degradation mitigation potential	Extension models	Conclusion
Improved cookstoves for charcoal						
Training of cookstoves producers constructions improved cookstoves	Identification of the necessary materials Training sessions for groups in each cities	Diffusion of the economic interest of those cookstoves in market places	Proposition of small loans for households	Low Small reduction of monthly consumption of charcoal	Punctual mobilization of trainers	Not a priority Low costs Low human resources
Implantation of small industry to manufacture improved cookstoves	Need to identify a private partner	Employment creation	Need to be assessed – manufacture probably based in Quelimane or Nampula	Low Small reduction of monthly consumption of charcoal	Proposition via a call for proposals Loans to start the industry	Need a feasibility Assessment - Economic risks

	Technical feasibility	Social feasibility	Economic feasibility	Deforestation and forest degradation mitigation potential	Extension models	Conclusion
Assisted natural regeneration						
Assistance and monitoring of regeneration after charcoal production by charcoal makers	Trainings sessions of charcoal producers groups and monitoring	Higher work time for charcoal producers – possible necessity of incentives Probably more adapted to areas with low forest cover	No investments	Medium It will favor forest regeneration and, by doing so, maintain forest cover in the long term	High mobilization of extension team for trainings and monitoring High awareness on the interest of forest regeneration	Priority Focus on high production areas such as Ilé and Alto Molocé

	Technical feasibility	Social feasibility	Economic feasibility	Deforestation and forest degradation mitigation potential	Extension models	Conclusion
Planning and registration						
District land development plans	Easy to draft, Hard to implement			Very low		Not a priority (From the ER-PIN)
Land and farmers registration program			Land security will not drive agricultural intensification	Low		Not a priority (From the ER-PIN)

Exploração florestal:

- Hoje não há resgo ser ilegal => Mudar o ratio custo – beneficio de ser ilegal

ARRANJOS INSTITUCIONAIS PARA A IMPLEMENTAÇÃO

Recomendações:

- Coordenação da implementação ao nível do Governador
- Não descentralizar sistematicamente a coordenação ao nível distrital
- A transparência é fundamental: plataforma de informações + apoio jurídico + papel das ONG
- Contratos com os stakeholders, especialmente para a extensão agrícola