***Project: Improvements on The Study of Racial Discrimination among Police Officers Gun-shooting Events in Florida***

1. Hot Spots Analysis

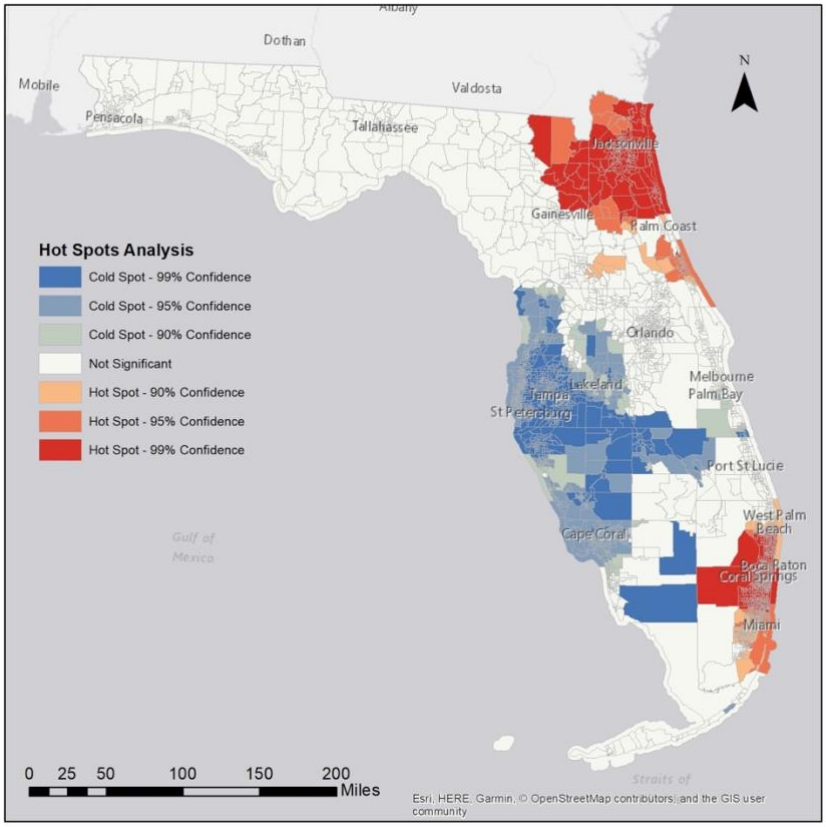


Figure1. Hot Spots Analysis at census tract level

According to the Figure, we could find that Jacksonville, West Palm Beach, Miami were shown as hot spots. It indicated that high incident rate of police officer gunshots were clustered in these places. Gun-shooting events were likely happening in these places as well as their neighborhood census tracts. On the other hands, Lakeland, Tampa, St Petersburg and Cape Coral were shown as cold spots. The gun-shooting incidence rate in these places and their neighborhood was low. Comparing with those hot spots, these regions are safer and have less gun-shooting events.

2. Spatial Probit Model

St. dev. of beta conditional on rho and Lik-ratio of rho

| | Estimate | Std. Error | z-value | Pr(>\|z\|) |
|---|---|---|---|---|
| (Intercept) | -0.056884825 | 1.1454400 | -0.049661988 | 0.9603917483657 |
| White_pct | -0.008652606 | 1.3545056 | -0.006388018 | 0.9949031339543 |
| Black_pct | -0.466711835 | 1.3404688 | -0.348170619 | 0.7277120518370 |
| Hispanic_p | -0.738221192 | 1.3908747 | -0.530760367 | 0.5955848476361 |
| Asian_pct | 4.986014651 | 2.5151634 | 1.982382033 | 0.0474364989242 |
| NormIncMed | -0.533237429 | 0.9234107 | -0.577465073 | 0.5636253265696 |
| Male_pct | 0.369123202 | 1.1400659 | 0.323773569 | 0.7461094681452 |
| VacantRate | 2.116473448 | 0.7754749 | 2.729261060 | 0.0063476430876 |
| MedAge | 0.146124580 | 0.4688248 | 0.311682691 | 0.7552816834321 |
| lambda | 0.517034235 | NA | 25.411738866 | 0.0000004630916 |

Table1. White victim against white officer analysis

From the results table of the white victim against the white officer, the Asian_pct (percentage of Asian population) and VacantRate(vacant household rate) independent variables showed significant, which meant that these two variables included in the spatial probit model were statistically significant from the null model. The Asian_pct and VacantRate variables were found positive coefficients, indicating that increasing Asian population and vacant household rate would increase the probability of the white officer shooting the white victim.

```
> effects(fit1_cond) # SAR probit model effects estimates
                direct     indirect        total
White_pct   -0.00315215 -0.003044551 -0.006196701
Black_pct   -0.17002344 -0.164219645 -0.334243086
Hispanic_p  -0.26893449 -0.259754335 -0.528688820
Asian_pct    1.81640855  1.754404956  3.570813506
NormIncMed  -0.19425876 -0.187627686 -0.381886446
Male_pct     0.13447184  0.129881603  0.264353438
VacantRate   0.77103273  0.744713316  1.515746042
MedAge       0.05323328  0.051416152  0.104649437
```

Table2. White victim against white officer analysis

The direct effect measures how a change in an independent variable in census tract i affects the dependent variable in census tract i. The indirect effects measure how changes in the explanatory variables associated with the census tract i cumulatively impact the dependent variables in all other n-1 census tracts. Total effects are defined as the sum of the direct and indirect effects. From the probit model effects estimates, we noticed that only two explanatory variables had 95% credible intervals that do not span zero for the direct, indirect, and total effects estimates.

The variable with a positive direct effect estimate is the Asian population and Vacant rate. The indirect effects for Asian_pct and VacantRate had similar magnitude with their direct effects. These indicated that the Asian population and vacant household rate had the same effects on their neighborhoods. It seems reasonable to find that Asian people who live in a community are more likely to find Asian neighbors. If an area with a high percentage of vacant houses, there is more likely to find vacant houses at its surrounding neighbors. The Total effect of Asian_pct and VacantRate would be interpreted that a 1% point increase in these two exploratory variables in a typical census tract would increase the probability of white officer kill white victims by 3.57% and 1.52% respectively.

***Project: Research about deforestation and carbon emission in São Luís, Brazil with Remote Sensing Image.***

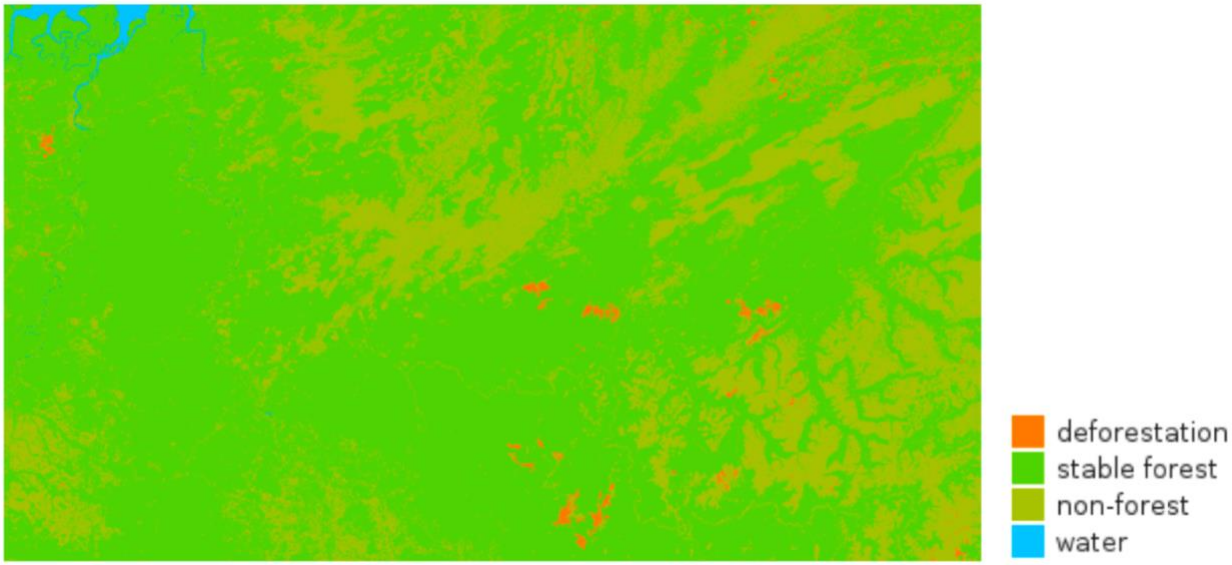


Figure 2. Classified change map for 2004 -2010

In the classified map the area of deforestation seems to be small. However, we don't know whether this map is accurate enough to address our problems and we don't know the area of our targeted class. Therefore, we calculate a confusion matrix with accuracy and area estimates to assess the result.

| | Error matrix, sample counts | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Reference | | | | | | |
| | Class | forest-loss | stable forest | non-forest | water | total | Map area | Wi |
| map | forest-loss | 43 | 7 | 0 | 0 | 50 | 119619 | 0.007 |
| | stable forest | 1 | 210 | 17 | 0 | 228 | 12428081 | 0.730 |
| | non-forest | 0 | 7 | 73 | 0 | 80 | 4377249 | 0.258 |
| | water | 0 | 0 | 0 | 50 | 50 | 90754 | 0.005 |
| | total | 44 | 224 | 90 | 50 | 408 | 17015703 | 1.000 |
| | Error matrix, estimated area proportions | | | | | | | |
| | | Reference | | | | | | |
| | Class | forest-loss | stable forest | non-forest | water | total | Map area | Wi |
| Map | forest-loss | 0.0060 | 0.0010 | 0.0000 | 0.0000 | 0.007 | 119619 | 0.007 |
| | stable forest | 0.0032 | 0.6724 | 0.0544 | 0.0000 | 0.73 | 12428081 | 0.730 |
| | non-forest | 0.0000 | 0.0226 | 0.2354 | 0.0000 | 0.258 | 4377249 | 0.258 |
| | water | 0.0000 | 0.0000 | 0.0000 | 0.0050 | 0.005 | 90754 | 0.005 |
| | total | 0.0092 | 0.6959 | 0.2899 | 0.0050 | 1 | 17015703 | 1.000 |
| | area[pix] | 156915 | 11841626 | 4932084 | 85079 | 17015703 | | |
| | area[ha] | 14122.3170 | 1065746.3619 | 443887.5247 | 7657.0664 | | | |
| | S(Area) | 0.0032 | 0.0154 | 0.0151 | 0.0000 | | | |
| | S(Area)[ha] | 4931.9190 | 23630.3890 | 23187.7637 | 0.0000 | | | |
| | 95% CI[ha] | 9666.5613 | 46315.5625 | 45448.0168 | 0.0000 | | | |
| | User's | 0.8600 | 0.9211 | 0.9125 | 1.0000 | | | |
| | Producer's | 0.6528 | 0.9662 | 0.8122 | 1.0000 | | | |
| | Overall | 0.9188 | | | | | | |

Table 3. Accuracy assessment and area estimation (2004 – 2010)

We could get more detail information about deforestation from figure 4. According to the deforestation in classified map, we find these regions in images from 2004 and 2010. In fact, these regions should be non-forest or stable forest, however, these regions are classified as deforestation. I think the reason is that these areas are covered by clouds and the reflectance of clouds is high. It makes the reflectance different from that of stable forest or non-forest and the result is wrong. We can also know the difference between estimated area and mapped area according to figure 5.

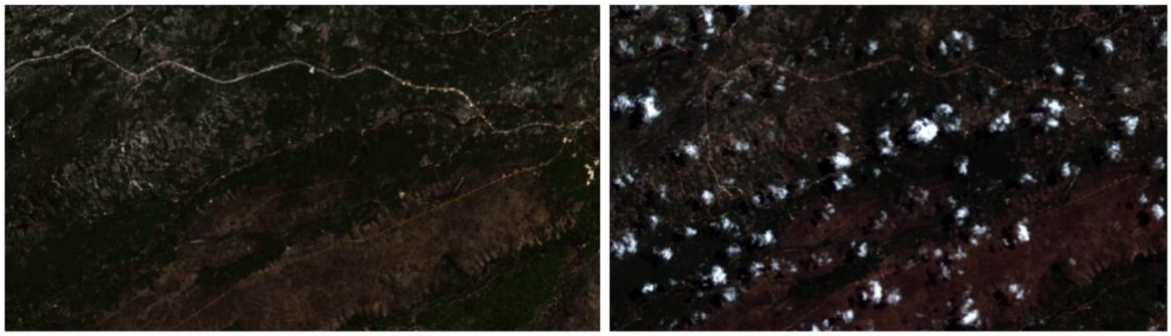

Figure 4 The deforestation area (left: 2004, right: 2010)

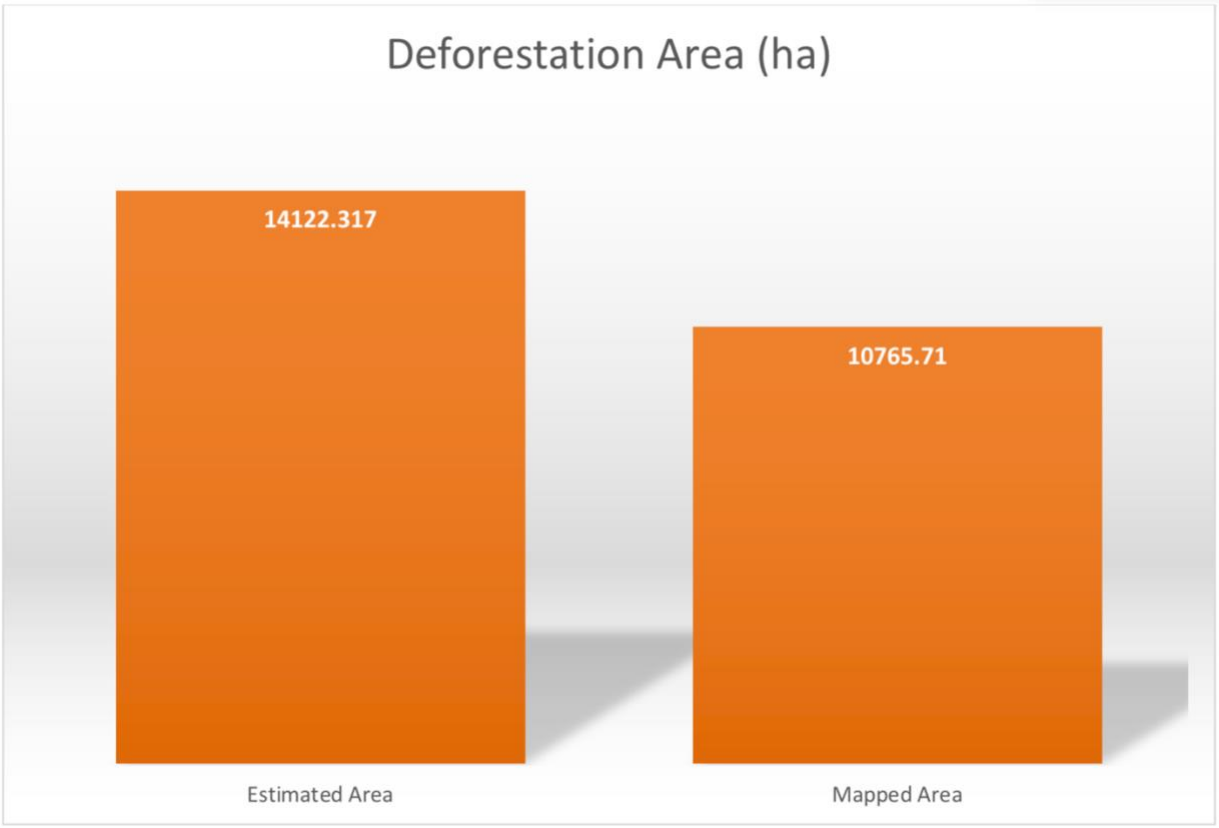


Figure 5. The difference between estimated area and mapped area

According to Figure 6 and figure 7, we could find that forests became urban or bare land.

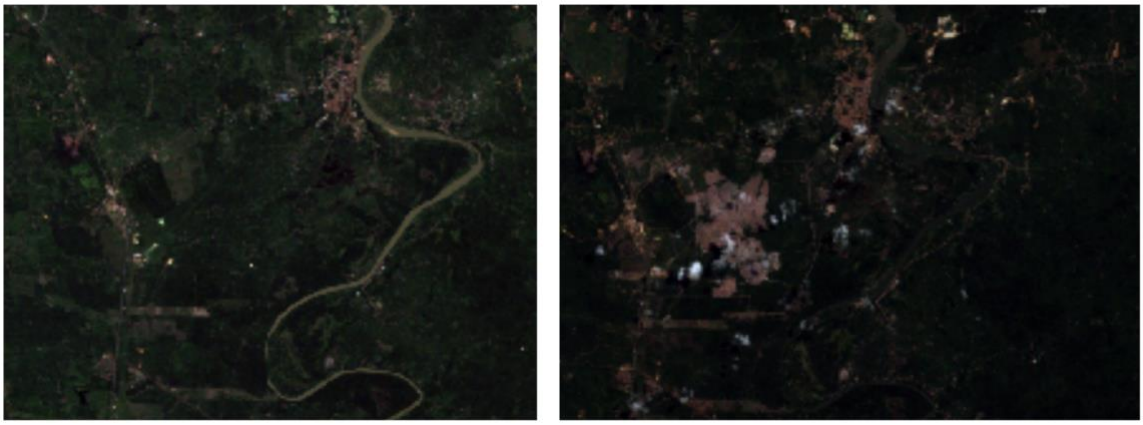

Figure 6. The deforestation area (left:2004, right 2010)

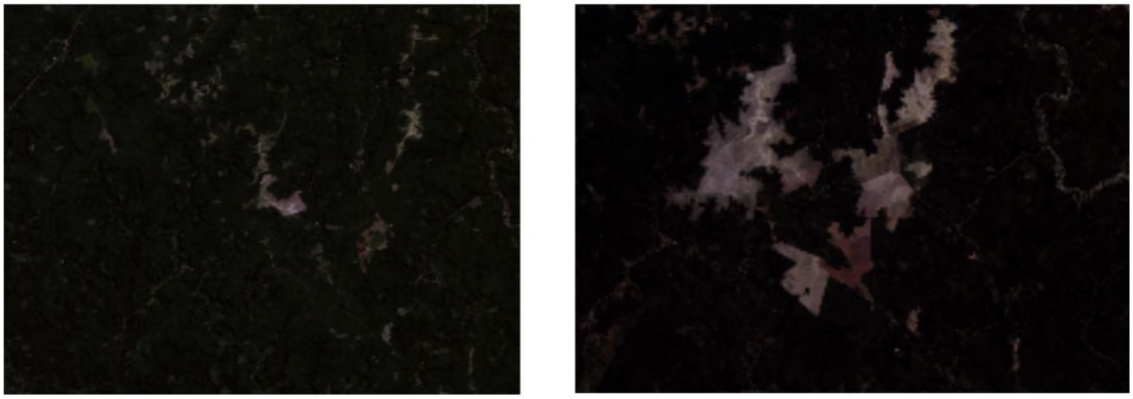

Figure 7. The deforestation area (left:2004, right 2010)

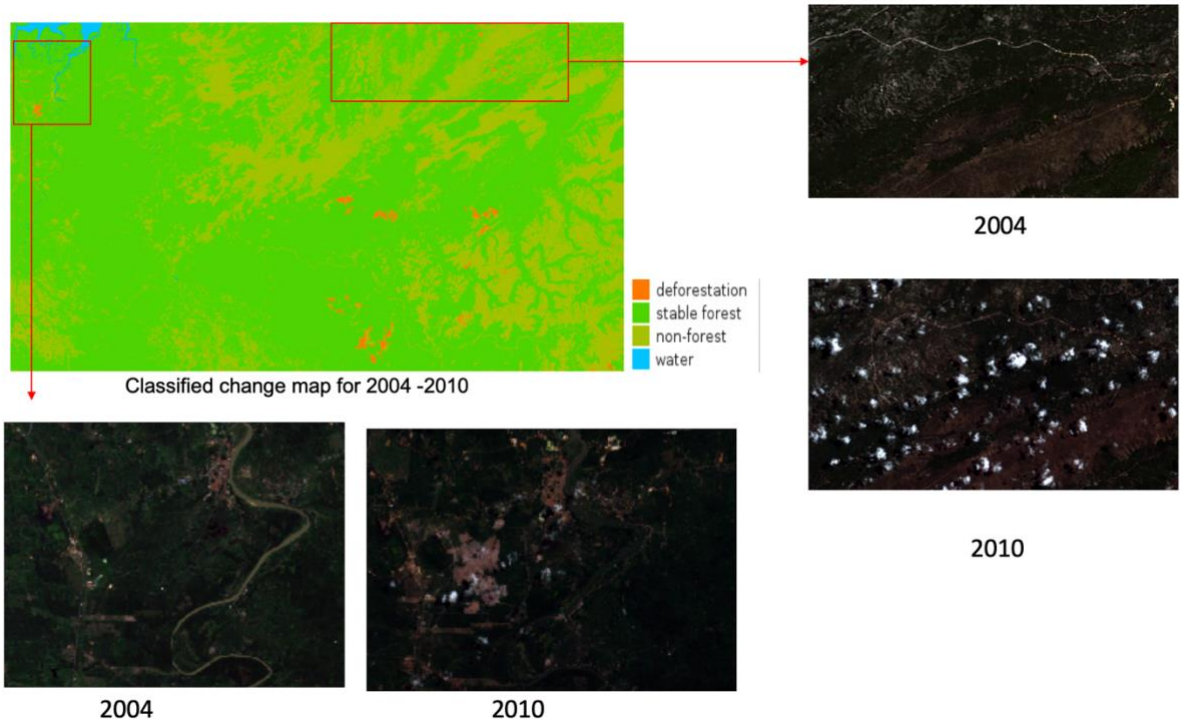


Figure 8. The change between 2004-2010

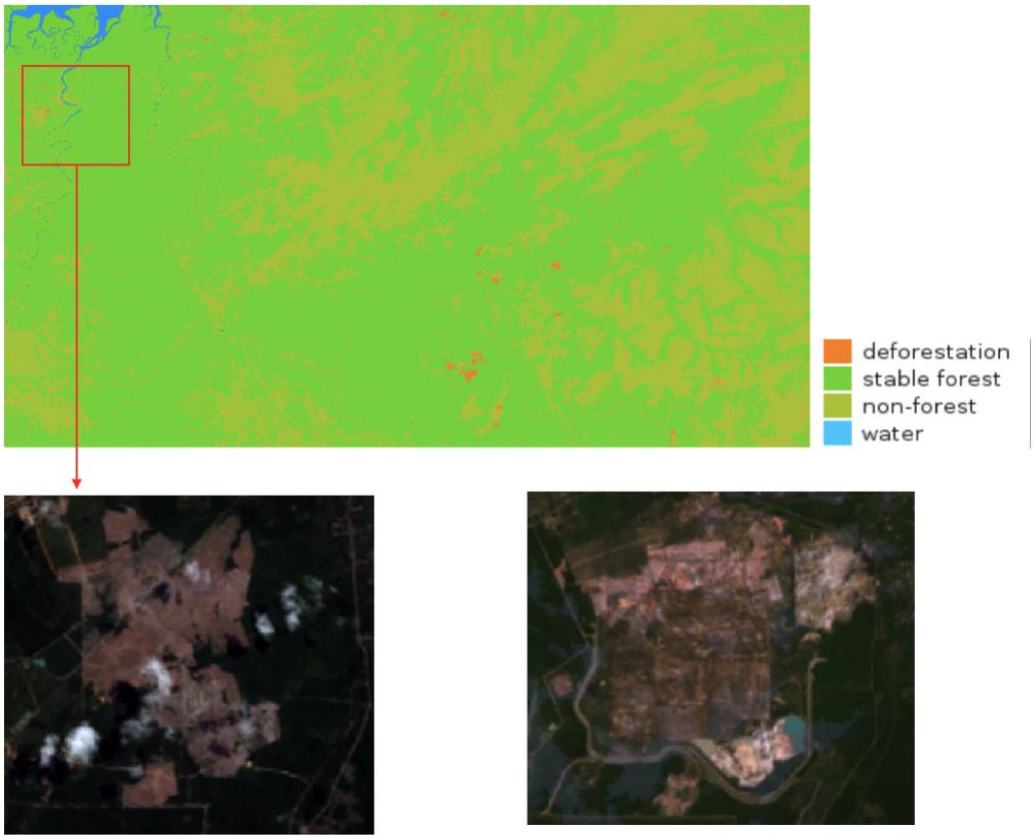


Figure 9. The change between 2010-2016

For REDD+, we need to calculate the carbon emission from 2004 to 2010 and 2010 to 2016. According to figure 10, we could know the deforestation area with 95% confidence interval for 2004 – 2010 and 2010 – 2016. The figure 10 also shows the mapped area. We can know that for time series 1, the mapped area is not within the estimate area with 95% confidence interval. I think the reason may be that the cloud influences the accuracy of map, it also influences the mapped area of deforestation. For time series 2 (i.e. from 2010 to 2016), the mapped area is within the estimated area with 95% confidence interval. We can calculate the carbon emission because we know the deforestation area. The figure 11 shows the carbon emission for two time series.

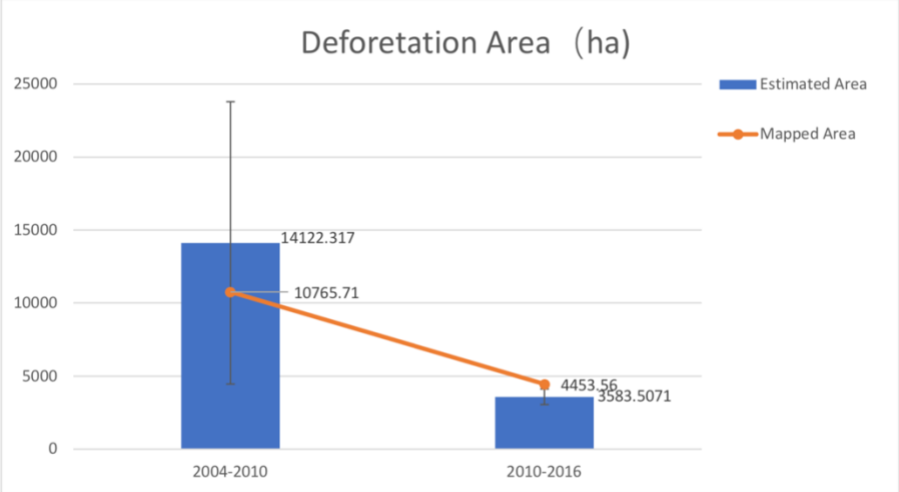


Figure 10. Deforestation area with 95% confidence interval for two time series

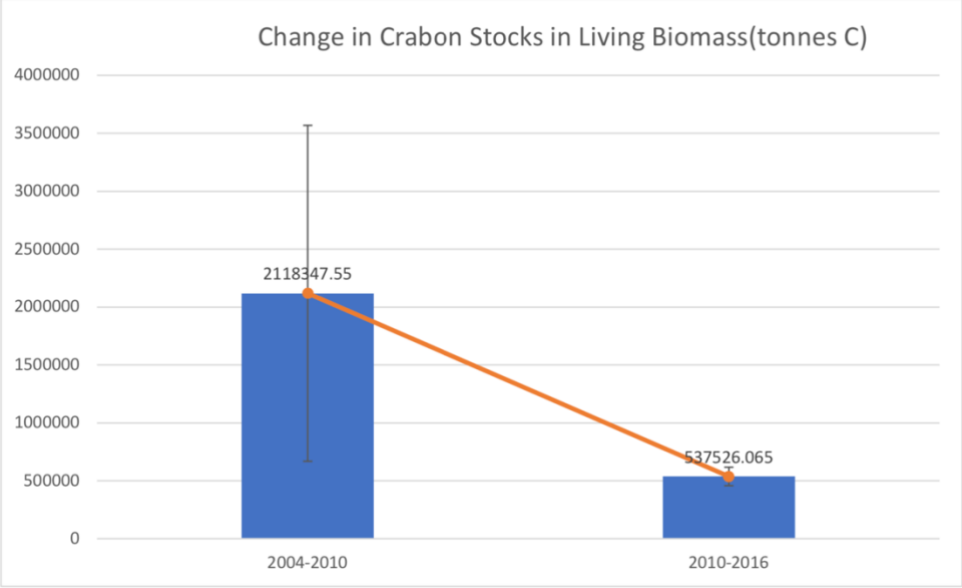


Figure11. Change in carbon stocks in living biomass

We can know that the deforestation area in São Luís decreased from 2004 and 2016. The carbon emission also decreased. The policy about Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+) is help for reducing carbon emission in this region. From 2004 to 2016, these deforestation areas became urban or bare land. It means that urbanization may occur in São Luís.

The change map of 2004 -2010 about deforestation is not very accurate because of clouds. We need to pay attention when we use this map, especially the top right corner of map. If we want to use change map of 2010 to 2016, we need be careful, because the mapped area of deforestation is not within estimated area within 95% confidence interval.