

# Introdução ao geoprocessamento para Etnobiologia e Conservação da Biodiversidade

## 7 Introdução e funcionamento do software QGIS

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# 7 Introdução ao QGIS

## Tópicos

- 7.1 Interface do QGIS
- 7.2 Plugins (complementos)
- 7.3 Caixa de ferramentas
- 7.4 Projeto no QGIS
- 7.5 Adicionar dados vetoriais preexistentes
- 7.6 Propriedades de dados vetoriais
- 7.7 Tabela de atributos
- 7.8 Tabela de atributos - cálculos
- 7.9 Geoprocessamento de dados vetoriais
- 7.10 Criação de dados vetoriais
- 7.11 Edição de dados vetoriais
- 7.12 Fotointerpretação de imagens
- 7.13 Verificação geométrica e ajuste topológico
- 7.14 Reprojetar e exportar dados vetoriais



# 7 Introdução ao QGIS

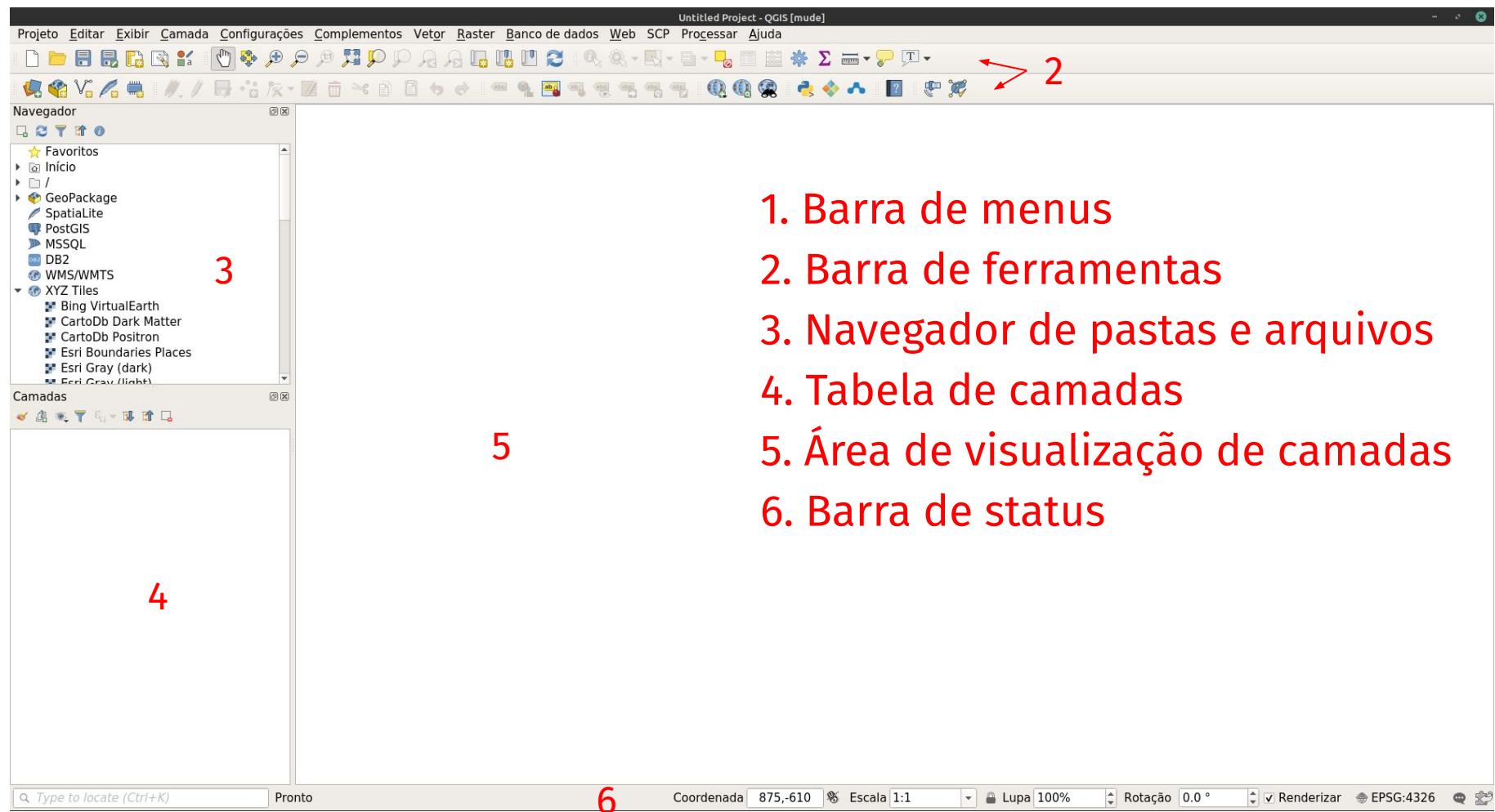
## Tópicos

- 7.15 Adicionar dados matriciais preexistentes
- 7.16 Propriedades de dados matriciais
- 7.17 Mosaico (unir raster)
- 7.18 Recorte (extração de máscara)
- 7.19 Alinhar raster
- 7.20 Topografia
- 7.21 Conversão de dados vetoriais e dados matriciais
- 7.22 Calculadora raster
- 7.23 Reprojetar e exportar dados matriciais
- 7.24 Elaboração de mapa temáticos



# 7.1 Interface do QGIS

## Interface



# 7.1 Interface do QGIS

## Configurações da interface

The screenshot shows the QGIS application window titled "Untitled Project - QGIS [mude]". The interface includes a top menu bar with options like Projeto, Editar, Exibir, Camada, Configurações, Complementos, Vetor, Raster, Banco de dados, Web, SCP, Processar, and Ajuda. Below the menu is a toolbar with various icons for file operations, selection, measurement, and analysis. On the left, there are two panels: "Navegador" (Navigator) containing a tree view of data sources like Favorites, Início, GeoPackage, SpatiaLite, PostGIS, MSSQL, DB2, WMS/WMTS, and XYZ Tiles; and "Camadas" (Layers) showing a list of layers. On the right, there is a "Painéis" (Panels) section with a list of checkboxes for various panels, many of which are checked. A red box highlights the "Painéis" section. At the bottom, there is a status bar with fields for Coordenada (Coordinate), Escala (Scale), Lupa (Zoom), Rotação (Rotation), Renderizar (Render), and EPSG:4326.

**Digitalização avançada**  
**Ferramentas de aderência**  
**Ferramentas de digitalização de forma**  
**Gerenciar camadas**

**Painéis**

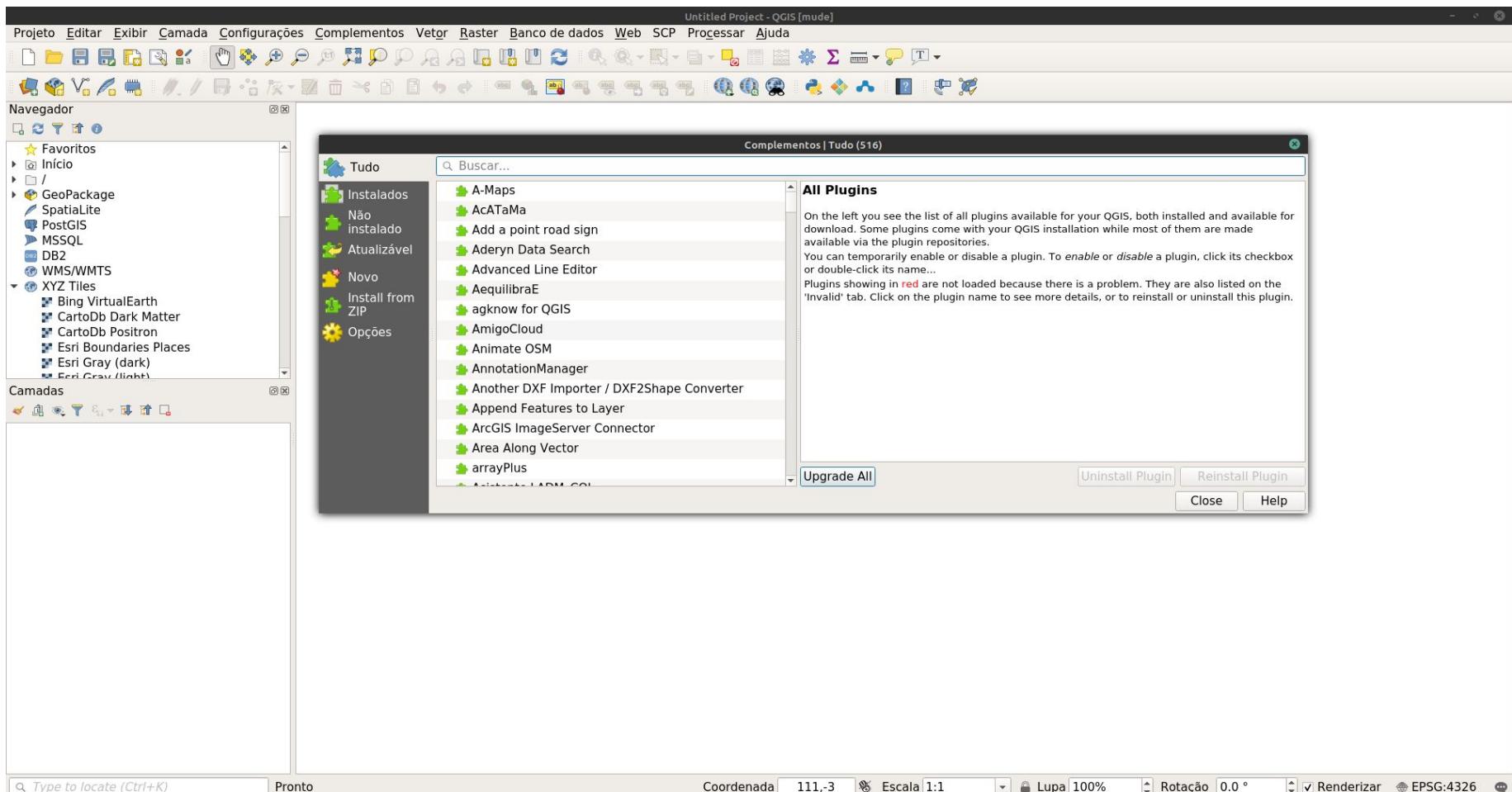
- GGIS Cloud Panel
- Browser (2) Panel
- Caixa de Ferramentas de processamento Panel
- Camadas Panel
- Desfazer/Refazer Panel
- Digitalização Avançada Panel
- Estatísticas Panel
- Estilização de camadas Panel
- Favoritos Espaciais Panel
- Informação do GPS Panel
- MapBiomas Collection 4 Panel
- Navegador Panel
- Ordem de camada Panel
- Registro de mensagens Panel
- SCP Dock Panel
- Search QMS Panel
- Tile Scale Panel
- Visão geral Panel
- Visualizador de resultados Panel

**Barra de Ferramentas**

- Ajuda
- Atributos
- Barra de Ferramentas do Gerenciador de Fonte de Dados
- Barra de ferramentas do Projeto
- Base de dados
- Complementos
- Digitalização Avançada
- Digitalizar
- Ferramentas de aderência
- Ferramentas de digitalização de forma
- Gerenciar camadas
- Mapa de Navegação
- Raster
- Rótulo
- SCP Edit Toolbar
- SCP Working Toolbar
- Vetor
- Web

## 7.2 Plugins (complementos)

### Pequenos programas adicionais



## 7.2 Plugins (complementos)

### Plugin - Ferramentas de GPS



The screenshot shows the QGIS application interface with the 'Complementos' (Plugins) window open. The window title is 'Complementos | Instalados (16)'. A search bar at the top right contains the text 'GPS'. The main list shows one item: 'Ferramentas de GPS' (checked), with a note below it stating 'This is a core plugin, so you can't uninstall it'. The 'Ferramentas de GPS' entry has a detailed description: 'Ferramentas para carregar e descarregar dados de GPS', 'Categoria: Vetor', and 'Installed version: Versão 0.1'. At the bottom of the window are buttons for 'Upgrade All', 'Uninstall Plugin', 'Reinstalar complemento', 'Close', and 'Help'. The background shows the standard QGIS toolbar and sidebar.

## 7.2 Plugins (complementos)

### Plugin - Verificador de topologia



Screenshot of QGIS interface showing the 'Complementos' (Plugins) window.

The 'Navegador' (Navigator) panel on the left shows installed plugins like Google Maps, Google Satellite, and Verificador de topologia.

The main window displays the 'Verificador de topologia' plugin details:

- This is a core plugin, so you can't uninstall it**
- Verificador de topologia**
- Um complemento para encontrar erros de topologia em camadas vetoriais**
- Categoria:** Vettore
- Installed version:** Versão 0.1

Buttons at the bottom include: Upgrade All, Uninstall Plugin, Reiniciar complemento, Close, and Help.

The status bar at the bottom shows: Type to locate (Ctrl+K), 1 entrada da legenda removida., Coordenada 284083,9115998, Escala 1:18025, Lupa 100%, Rotação 0.0°, Renderizar, and EPSG:31985.

# 7.2 Plugins (complementos)

## Mapas de base

Abrir o script:

```
disciplina-geoprocessamento/02_scripts/script_qgis_basemaps.py
```

```
~/.data/github/disciplina-geoprocessamento/02_scripts/script_qgis_basemaps.py - Sublime Text (UNREGISTERED)

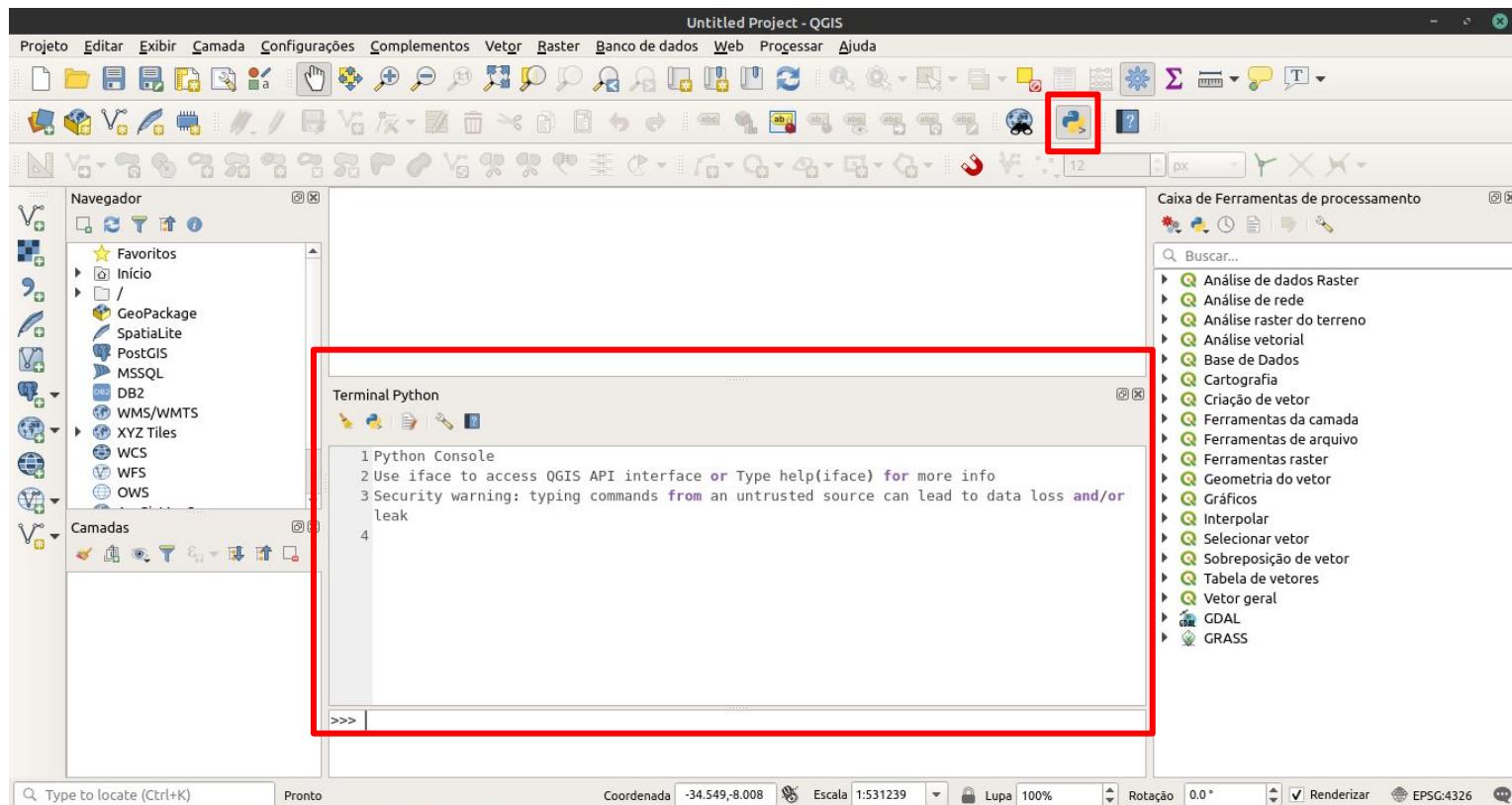
File Edit Selection Find View Goto Tools Project Preferences Help
untitled script_qgis_basemaps.py

1 """
2 This script should be run from the Python console inside QGIS.
3 Each source should contain a list with the following items (string type):
4 [sourceType, title, authConfig, password, referer, url, username, zmax, zmin]
5
6 You can add or remove sources from the sources section of the code.
7
8 by Klas Karlsson
9 Sources from https://qgis.nextgis.com/
10 Licence GPL-3
11
12 Regarding the terms of use for these background maps YOU will need to verify that you
13 follow the individual EULA that comes with the different services,
14 Most likely they will restrict how you can use the data.
15
16 """
17
18 # Sources
19 sources = []
20
21 sources.append(["connections-xyz", "Google Maps", "", "", "https://mt1.google.com/vt/lyrs=m&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D", "", "19", "0"])
22 sources.append(["connections-xyz", "Google Satellite", "", "", "https://mt1.google.com/vt/lyrs=sat&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D", "", "19", "0"])
23 sources.append(["connections-xyz", "Google Terrain", "", "", "https://mt1.google.com/vt/lyrs=t&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D", "", "19", "0"])
24 sources.append(["connections-xyz", "Google Hybrid", "", "", "https://mt1.google.com/vt/lyrs=h&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D", "", "19", "0"])
25 sources.append(["connections-xyz", "Google Satellite Hybrid", "", "", "https://mt1.google.com/vt/lyrs=sat%7Bx%7D%7By%7D%7Bz%7D", "", "19", "0"])
26 sources.append(["connections-xyz", "Stamen Terrain", "", "", "https://stamen.com/terrain/tile.php?x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D", "", "19", "0"])
27 sources.append(["connections-xyz", "Stamen Toner", "", "", "https://stamen.com/toner/tile.php?x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D", "", "19", "0"])
28 sources.append(["connections-xyz", "Stamen Toner Light", "", "", "https://stamen.com/toner-light/tile.php?x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D", "", "19", "0"])
29 sources.append(["connections-xyz", "Stamen Watercolor", "", "", "https://stamen.com/watercolor/tile.php?x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D", "", "19", "0"])
30 sources.append(["connections-xyz", "Wikimedia Map", "", "", "https://maps.wikimedia.org/osm-intl/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "20", "1"])
31 sources.append(["connections-xyz", "OpenStreetMap contributors", under ODBL, "https://tile.stamen.com/terrain/%7Bz%7D/%7By%7D/%7Bx%7D", "", "17", "1"])
32 sources.append(["connections-xyz", "Wikimedia Bike Map", "", "", "https://services.arcgis.com/World_Dark_Gray_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "17", "1"])
33 sources.append(["connections-xyz", "Esri Boundaries Places", "", "", "https://server.arcgisonline.com/arcgis/rest/services/Reference/World_Boundaries_and_Places/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "17", "0"])
34 sources.append(["connections-xyz", "Esri Gray (dark)", "", "", "http://services.arcgisonline.com/arcgis/rest/services/Canvas/World_Light_Gray_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "17", "0"])
35 sources.append(["connections-xyz", "Esri Gray (light)", "", "", "http://services.arcgisonline.com/arcgis/rest/services/Canvas/World_Light_Gray_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "17", "0"])
36 sources.append(["connections-xyz", "Esri Ocean", "", "", "https://services.arcgisonline.com/arcgis/rest/services/World_Water_Neutral/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "17", "0"])
37 sources.append(["connections-xyz", "Esri Satellite", "", "", "https://server.arcgisonline.com/arcgis/rest/services/World_Imagery/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "17", "0"])
38 sources.append(["connections-xyz", "Esri Standard", "", "", "https://server.arcgisonline.com/arcgis/rest/services/World_Street_Map/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "17", "0"])
39 sources.append(["connections-xyz", "Esri Terrain", "", "", "https://server.arcgisonline.com/arcgis/rest/services/World_Terrain_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "13", "0"])
40 sources.append(["connections-xyz", "Esri Transportation", "", "", "https://server.arcgisonline.com/arcgis/rest/services/Reference/World_Transportation/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "20", "0"])
41 sources.append(["connections-xyz", "Esri Topo World", "", "", "http://services.arcgisonline.com/arcgis/rest/services/World_Topo_Map/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D", "", "19", "0"])
42 sources.append(["connections-xyz", "OpenStreetMap Standard", "", "", "OpenStreetMap contributors, CC-BY-SA, http://tile.openstreetmap.org/%7Bz%7D/%7By%7D/%7Bx%7D", "", "19", "0"])
43 sources.append(["connections-xyz", "OpenStreetMap H.O.T.", "", "", "OpenStreetMap contributors, CC-BY-SA, http://tile.openstreetmap.fr/hot/%7Bz%7D/%7By%7D/%7Bx%7D", "", "19", "0"])
44
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```

## 7.2 Plugins (complementos)

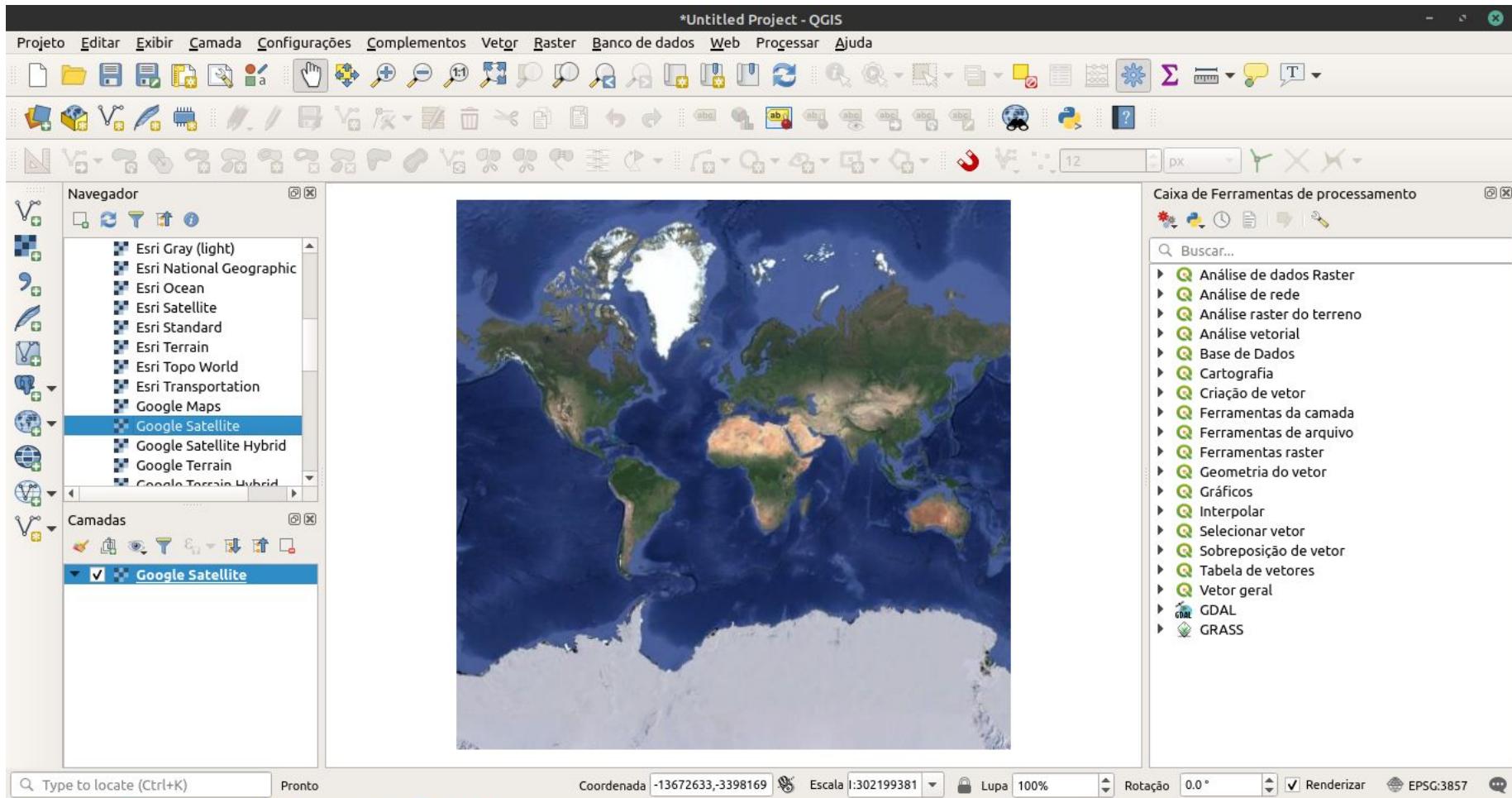
### Mapas de base

Abrir o terminal python, copiar e colar o conteúdo do script. Abrir XYZ files



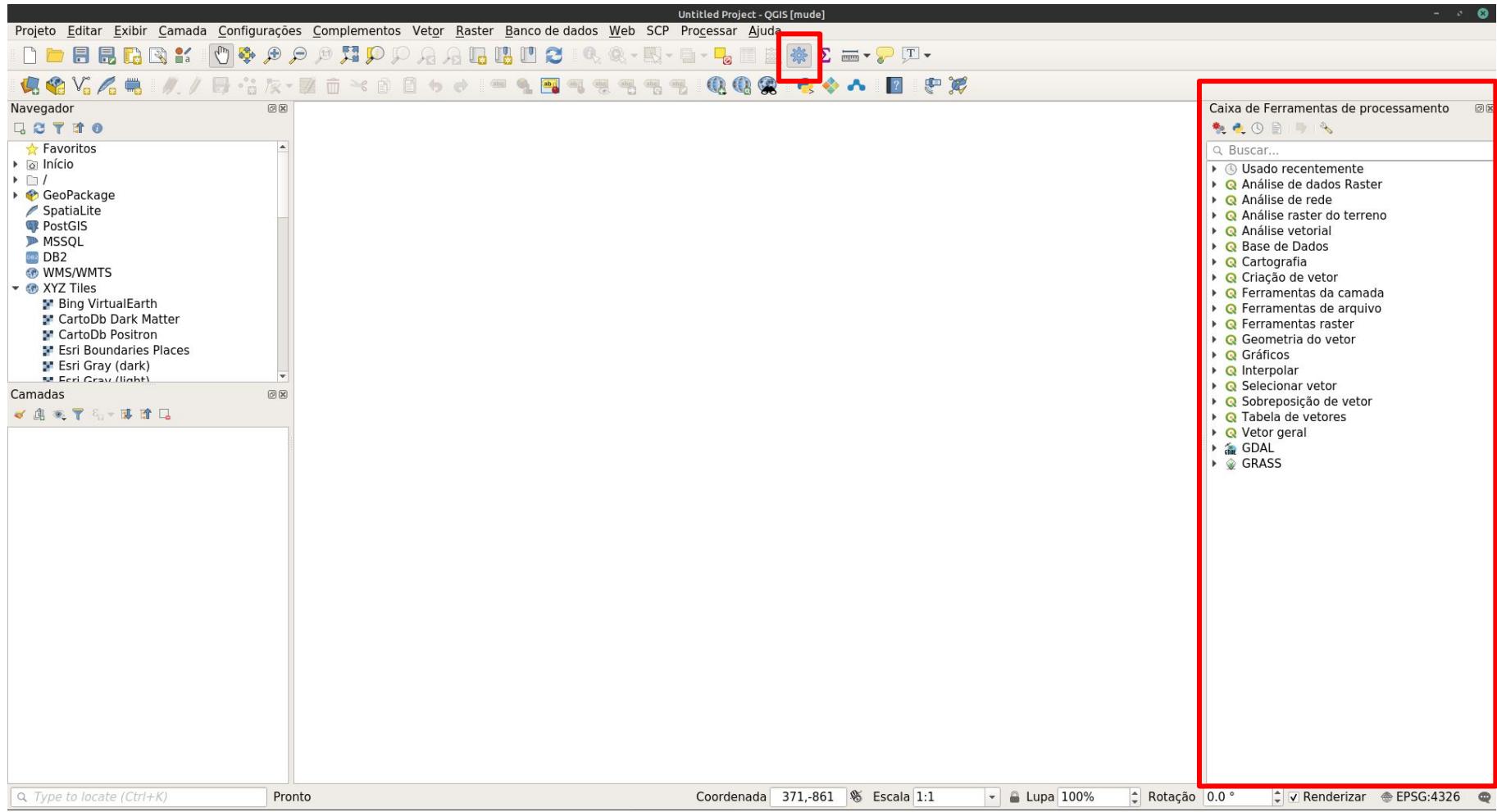
## 7.2 Plugins (complementos)

### Mapas de base



## 7.3 Caixa de ferramentas

Possui diversas ferramentas do GRASS e GDAL



## 7.4 Projeto no QGIS

### Criar um projeto

Criar um arquivo de trabalho do QGIS (.qgz)

Mas antes, temos de definir um SRC (Sistema de Referência de Coordenadas)

```
Projeto > Propriedades... > SRC > Filtro > UTM 25S >
SIRGAS 2000 / UTM zone 25S EPSG:31985 > OK
```

## 7.4 Projeto no QGIS

### Criar um projeto

Criar um arquivo de trabalho do QGIS (.qgz)

Mas antes, temos de definir um SRC (Sistema de Referência de Coordenadas)

```
Projeto > Propriedades... > SRC > Filtro > UTM 25S >  
SIRGAS 2000 / UTM zone 25S EPSG:31985 > OK
```

### Salvar o projeto

```
Projeto > Salvar > pasta:  
github/disciplina-geoprocessamento/04_projeto_qgis
```

### Nome do projeto

```
00_projeto_qgis_utm_25s_sirgas2000.qgz
```

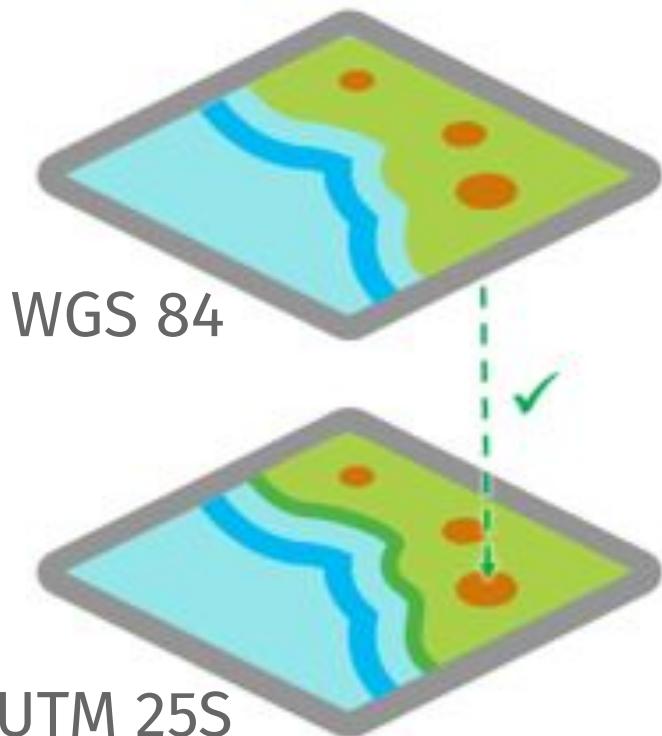
## 7.4 Projeto no QGIS

Mas e se alguma camada adicionada  
não estiver no mesmo SRC?

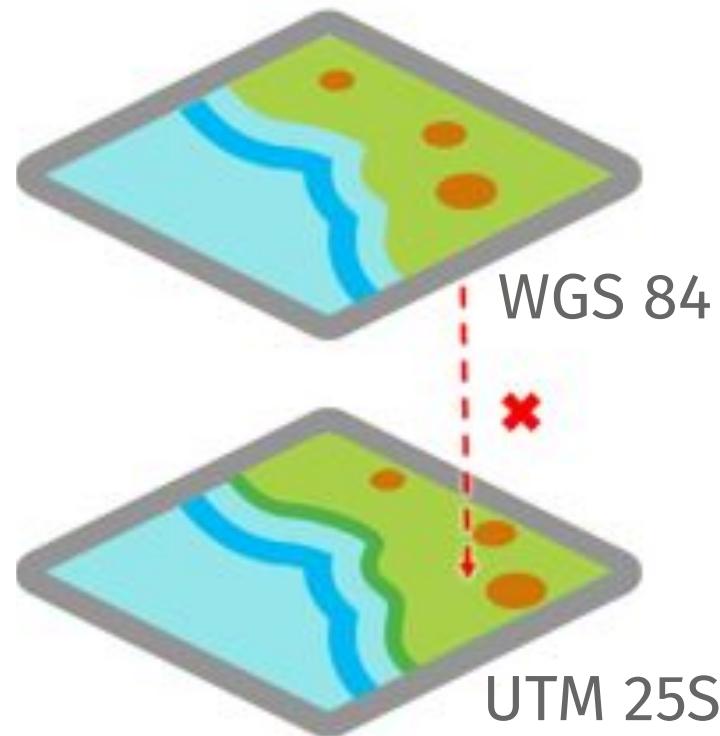
## 7.4 Projeto no QGIS

Reprojeção *on the fly*

Com *on the fly*



Sem *on the fly*



# 7.5 Adicionar dados vetoriais preexistentes

## Download de dados de Recife

<http://geo.fbds.org.br/PE/RECIFE/>



pasta: `github/disciplina-geoprocessamento/03_dados/01_vetor`

The screenshot shows a web interface for downloading geospatial data. At the top, there's a dark header with the text "FUNDAÇÃO BRASILEIRA PARA O DESENVOLVIMENTO SUSTENTÁVEL" and the fbds logo. Below the header, the URL "geo.fbds.org.br" is shown, followed by a breadcrumb navigation: PE > RECIFE > HIDROGRAFIA. On the left, there's a sidebar with a navigation tree: MG, MS\_em\_revisao, MT, PB, PE (which is expanded to show ABREU\_E\_LIMA, AGRESTINA, AGUA\_PRETA, ALIANCA, ALTINHO, AMARAJI, ANGELIM, ARACOIABA, and BARRA\_DE\_GUABIRABA). The main content area displays a list of files under the "HIDROGRAFIA" folder, which is also expanded. The list includes four items: APP, HIDROGRAFIA, MAPAS, and USO, all last modified on 31-01-2018 20:29. The entire list is highlighted with a blue background.

Nome	Última modificação	Tamanho
APP	31-01-2018 20:29	
HIDROGRAFIA	31-01-2018 20:29	
MAPAS	31-01-2018 20:29	
USO	31-01-2018 20:29	

## 7.5 Adicionar dados vetoriais preexistentes

Renomear os dados de Recife

```
RECIFE >> recife_raw
```



APP



HIDROGRAFIA



MAPAS



USO

# 6.7 Dados vetoriais

## Pontos, linhas e polígonos

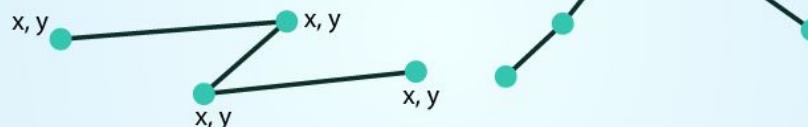
**POINTS:** Individual **x, y** locations.

ex: Center point of plot locations, tower locations, sampling locations.



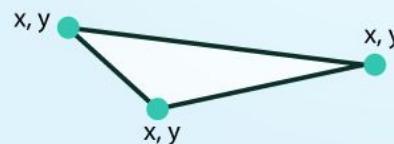
**LINES:** Composed of many (at least 2) vertices, or points, that are connected.

ex: Roads and streams.



**POLYGONS:** 3 or more vertices that are connected and **closed**.

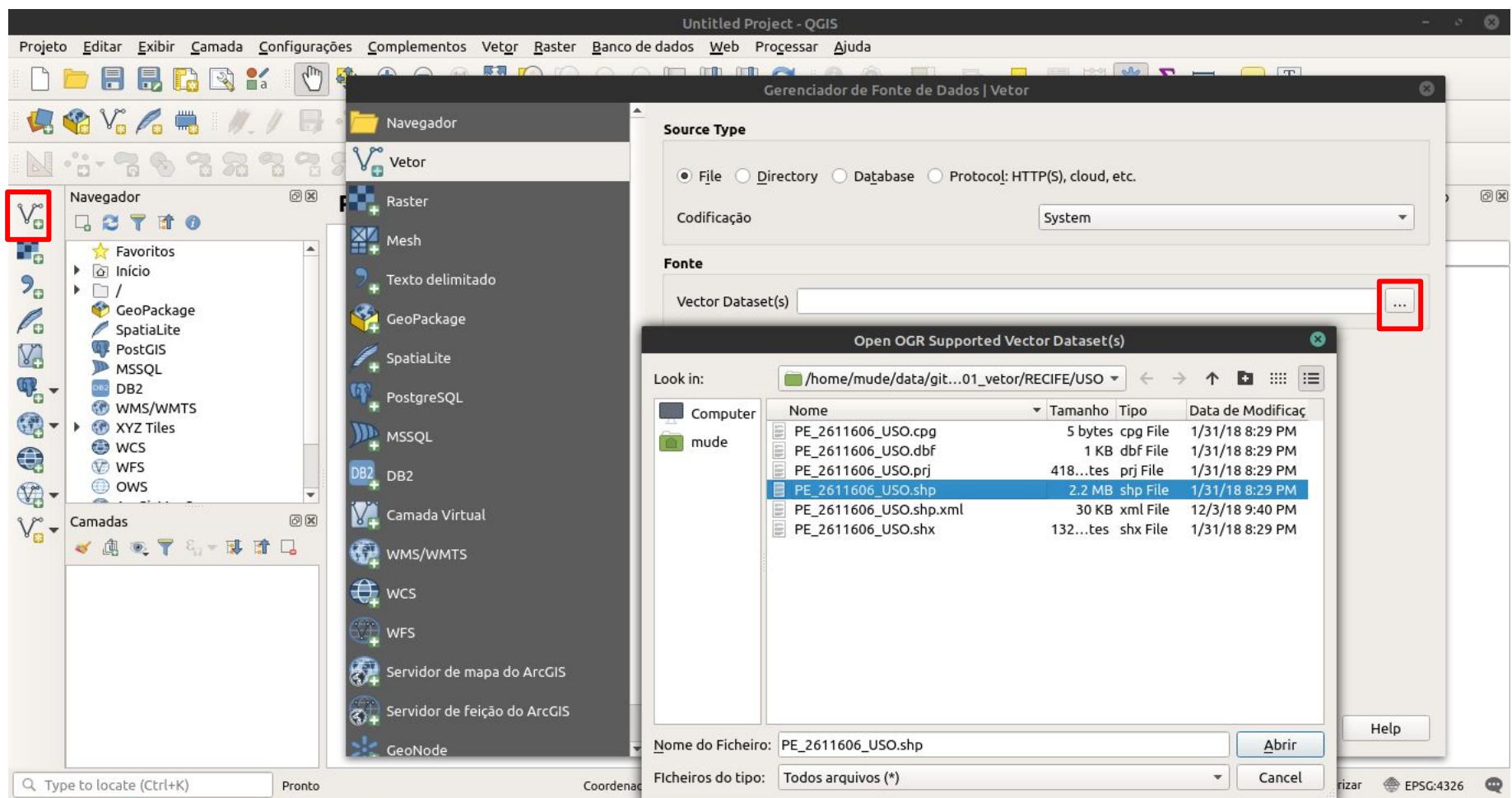
ex: Building boundaries and lakes.



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# 7.5 Adicionar dados vetoriais preexistentes

## Adicionar dados vetoriais (sempre .shp)



## 6.9 Formato de arquivos vetoriais

### Shapefile

Formato fechado de arquivos vetoriais



**\*.shp:** contém as informações do desenho

**\*.dbf:** tabela que contém as informação sobre cada forma  
do desenho, como nome, endereço etc.

**\*.shx:** é um arquivo de índice que une .shp ao .dbf

**\*.prj:** contém as informações do sistema de coordenadas



DBF



SHX

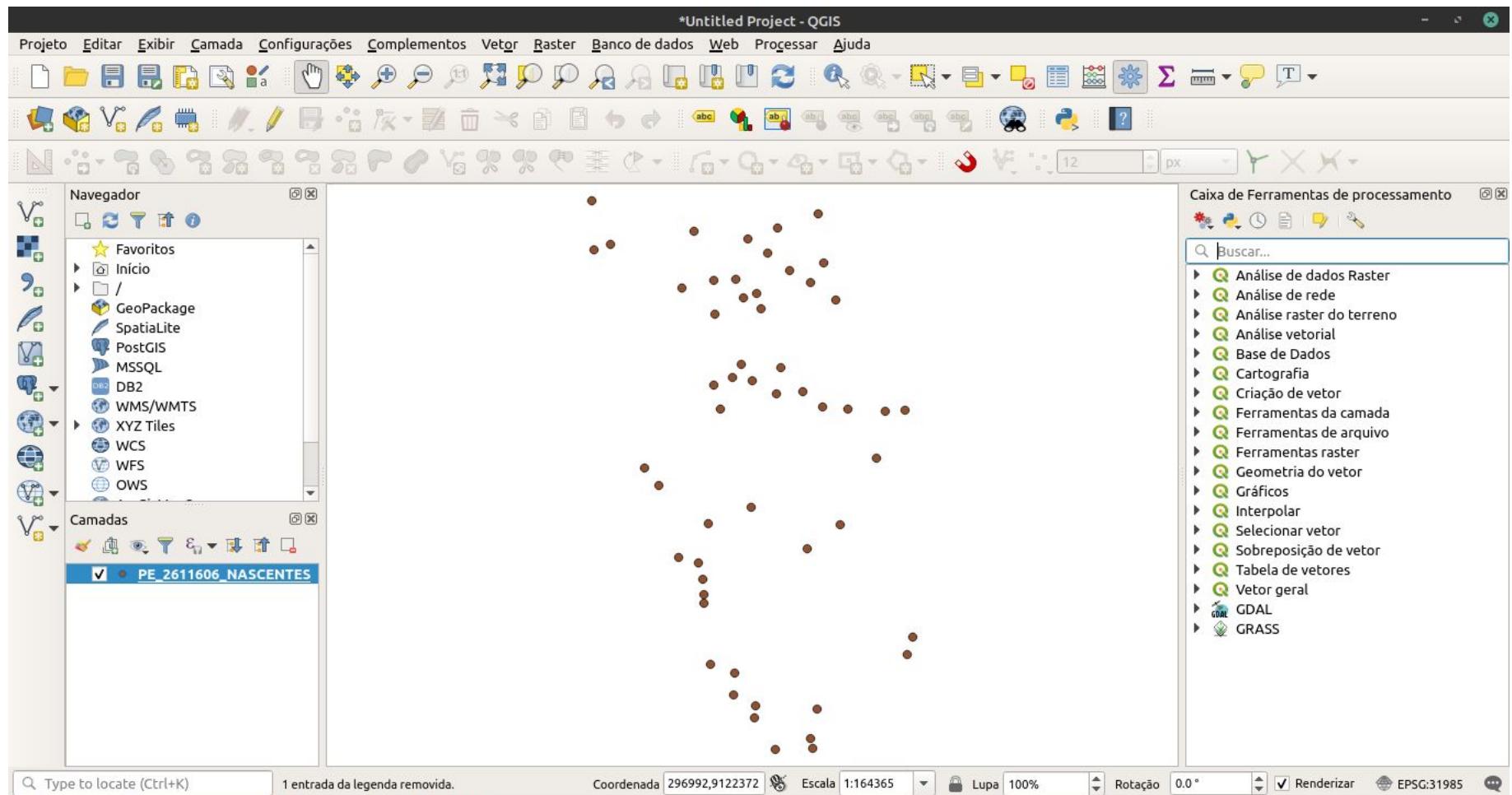


PRJ



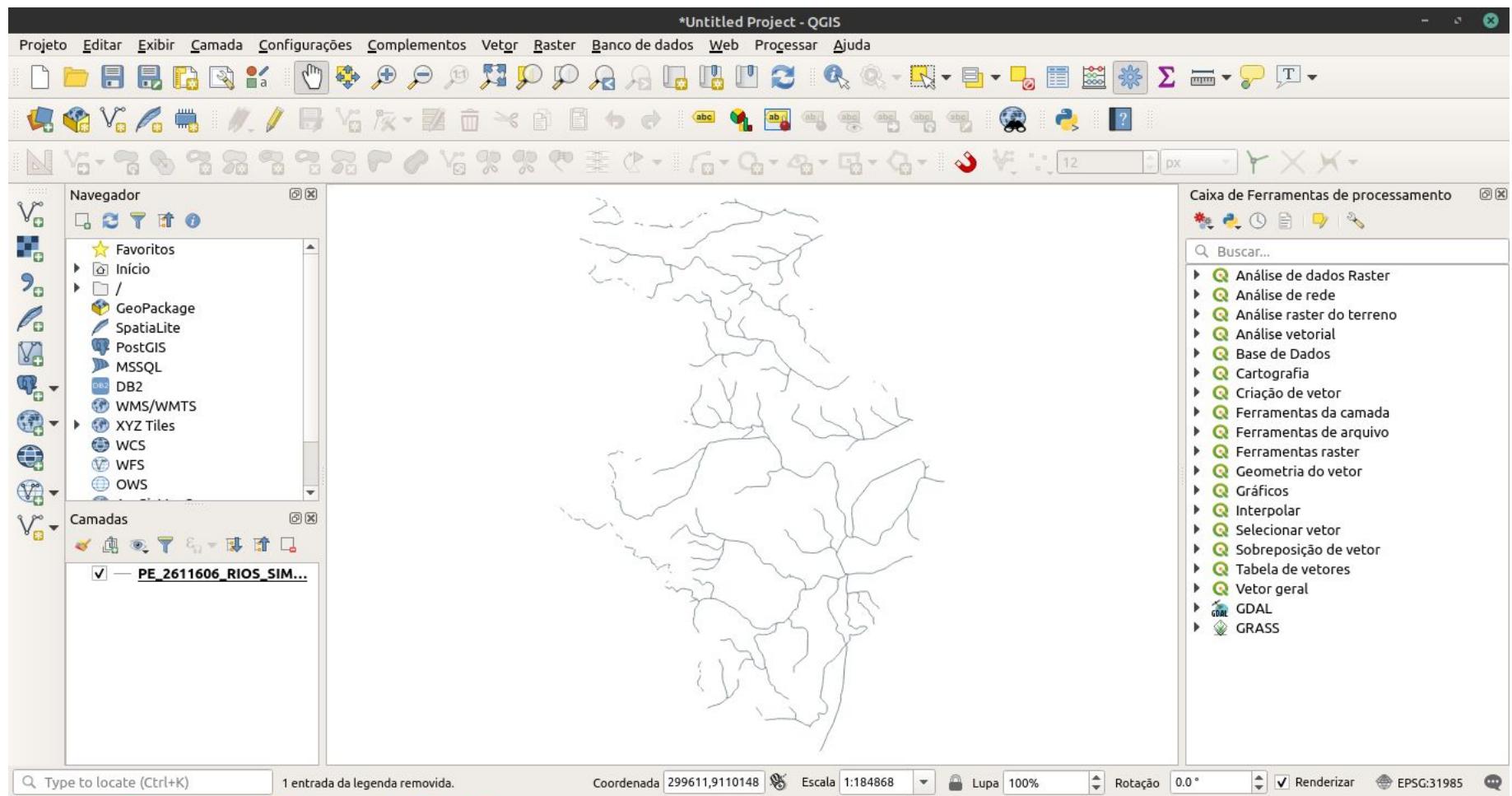
# 7.5 Adicionar dados vetoriais preexistentes

## Adicionar dados vetoriais - Pontos



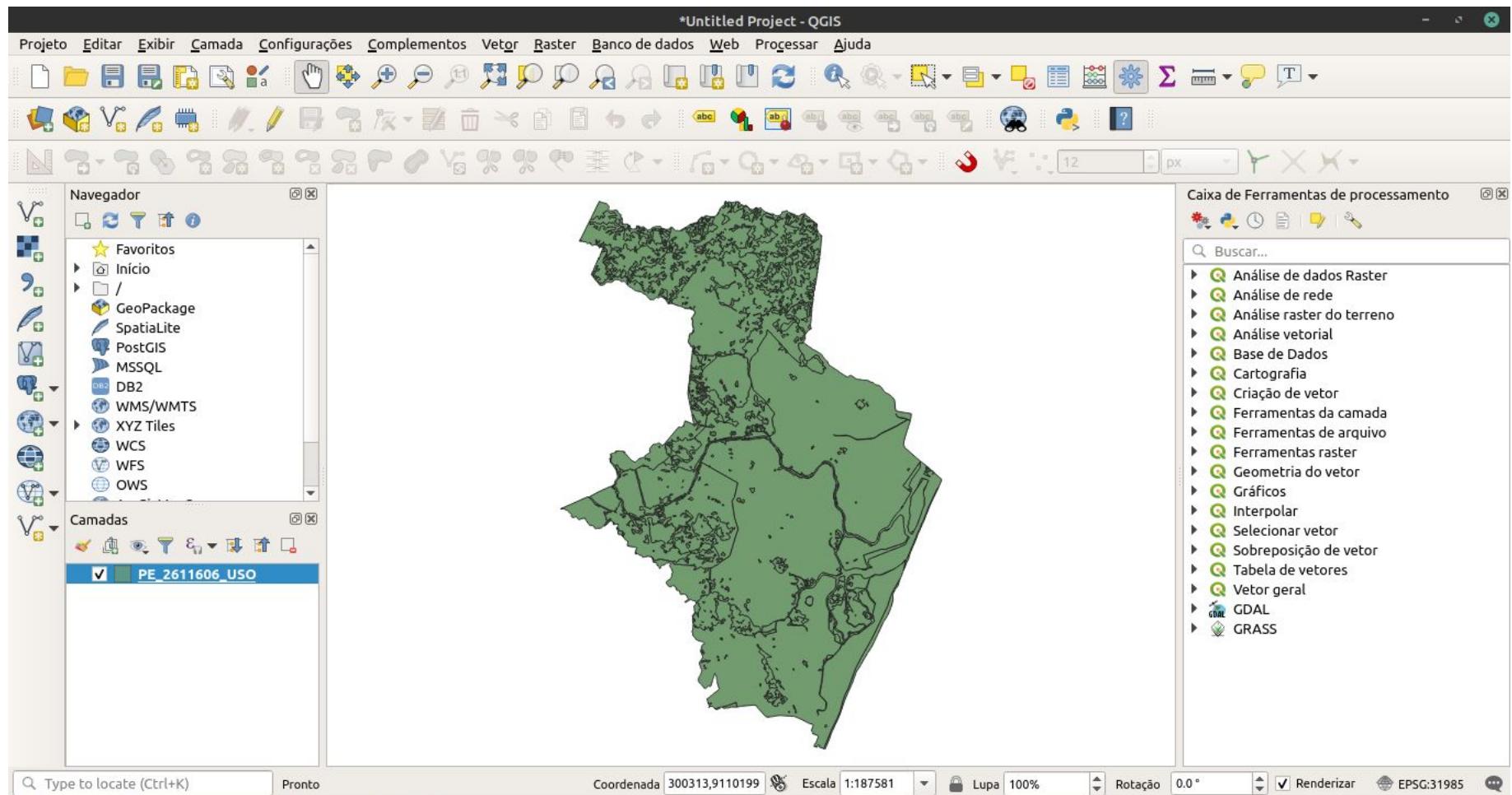
# 7.5 Adicionar dados vetoriais preexistentes

## Adicionar dados vetoriais - Linhas



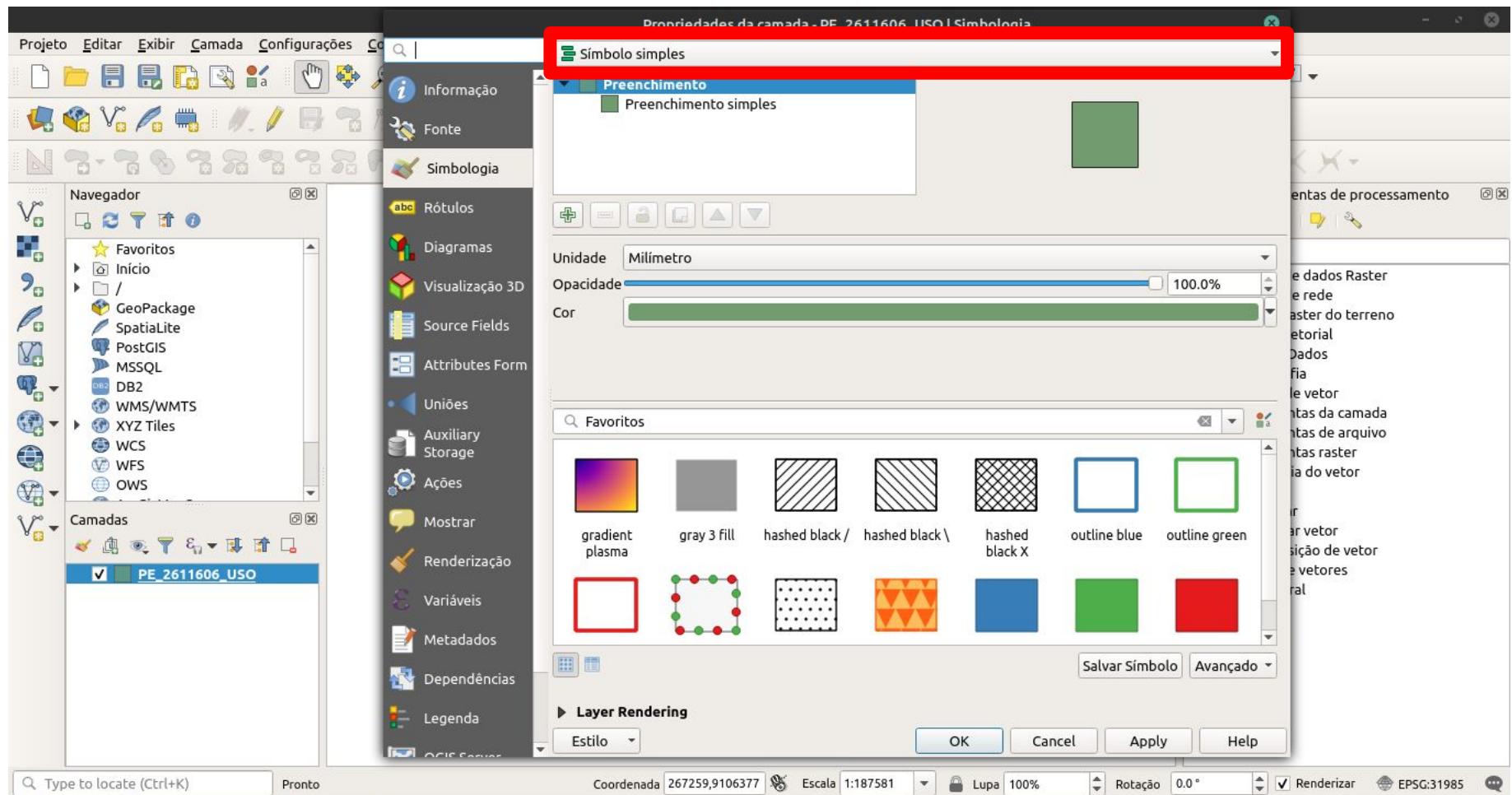
# 7.5 Adicionar dados vetoriais preexistentes

## Adicionar dados vetoriais - Polígonos



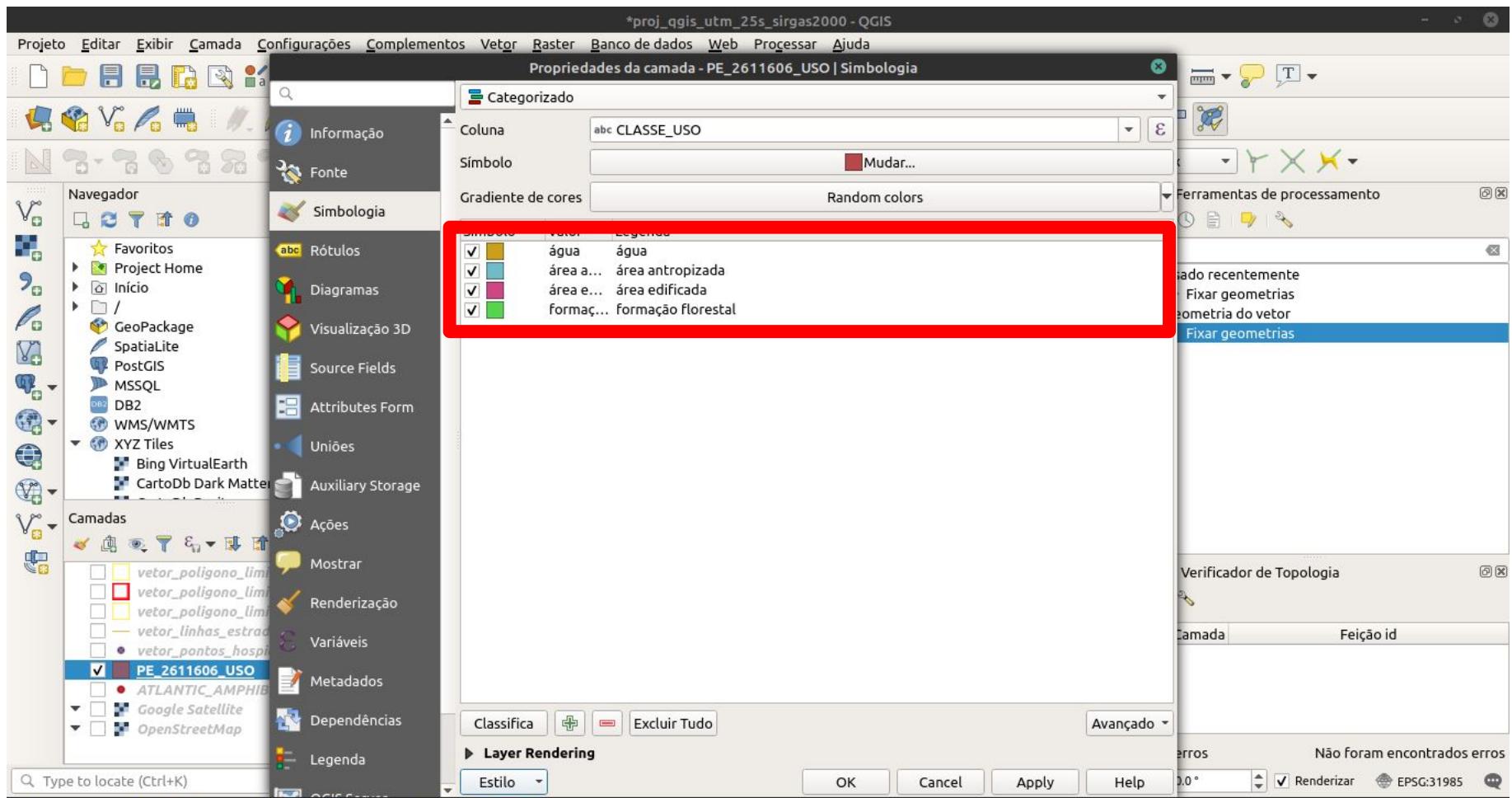
# 7.6 Propriedades de dados vetoriais

## Propriedades > Símbologia



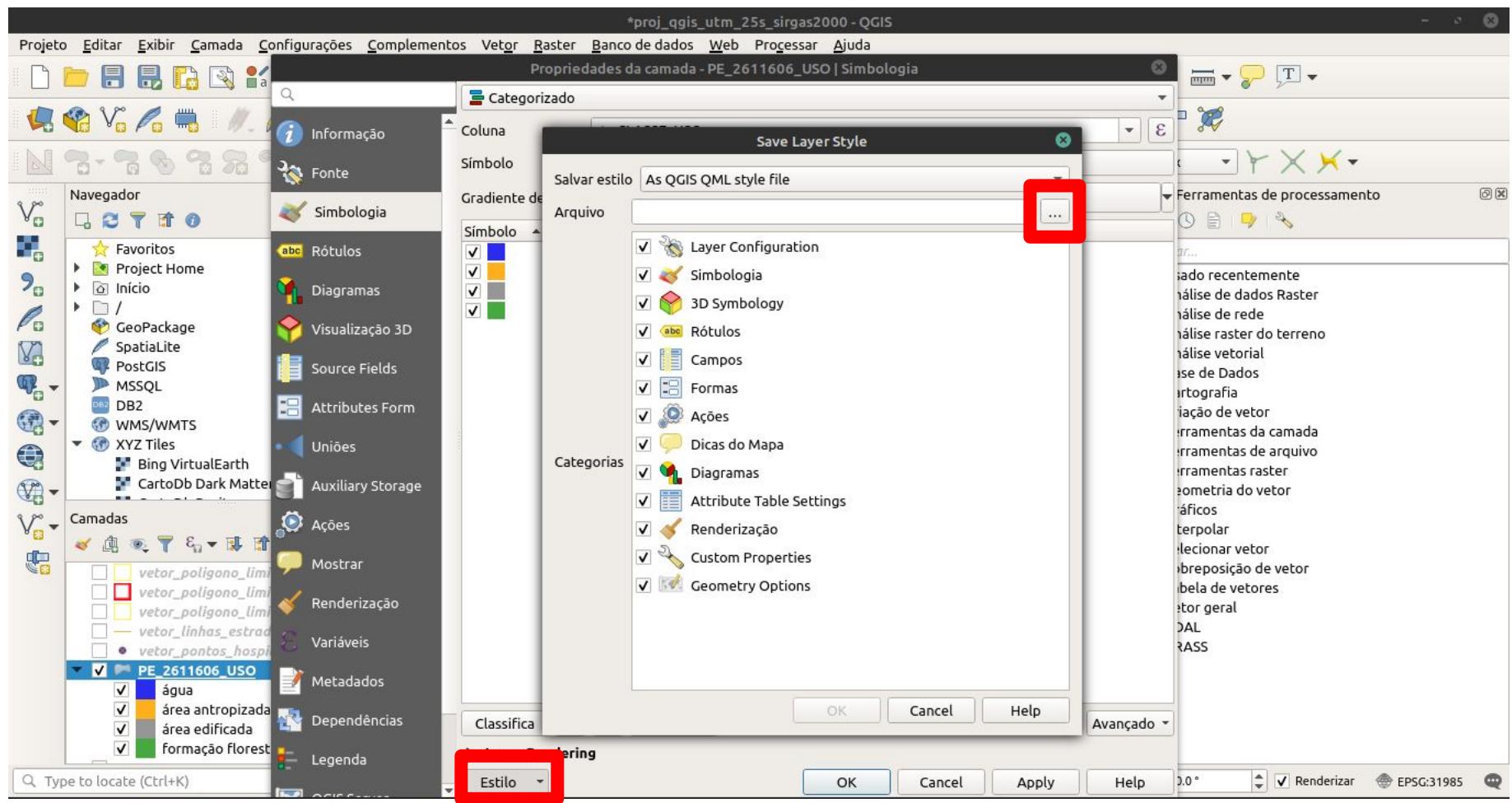
# 7.6 Propriedades de dados vetoriais

## Simbologia



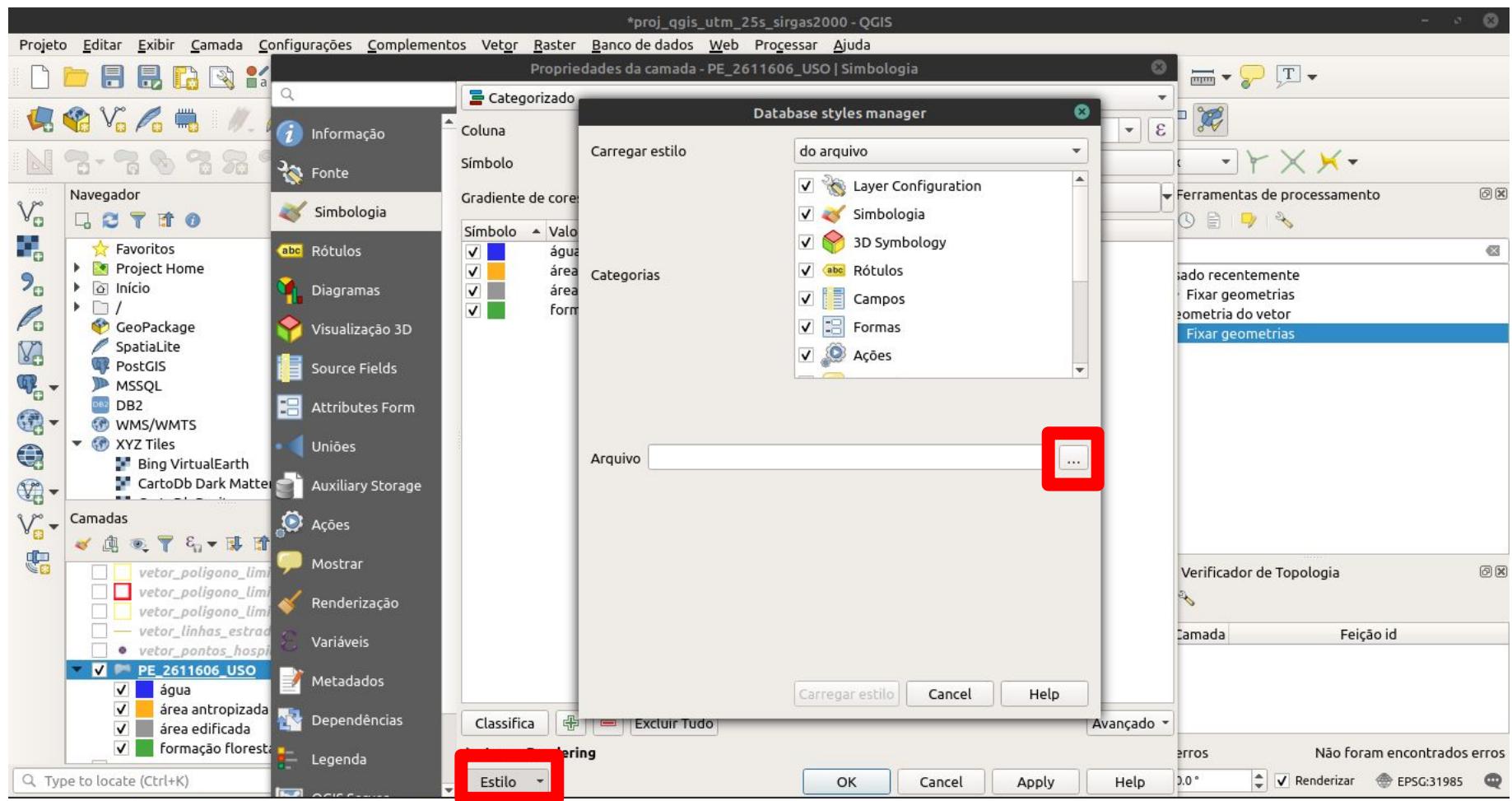
# 7.6 Propriedades de dados vetoriais

## Salva estilo da camada



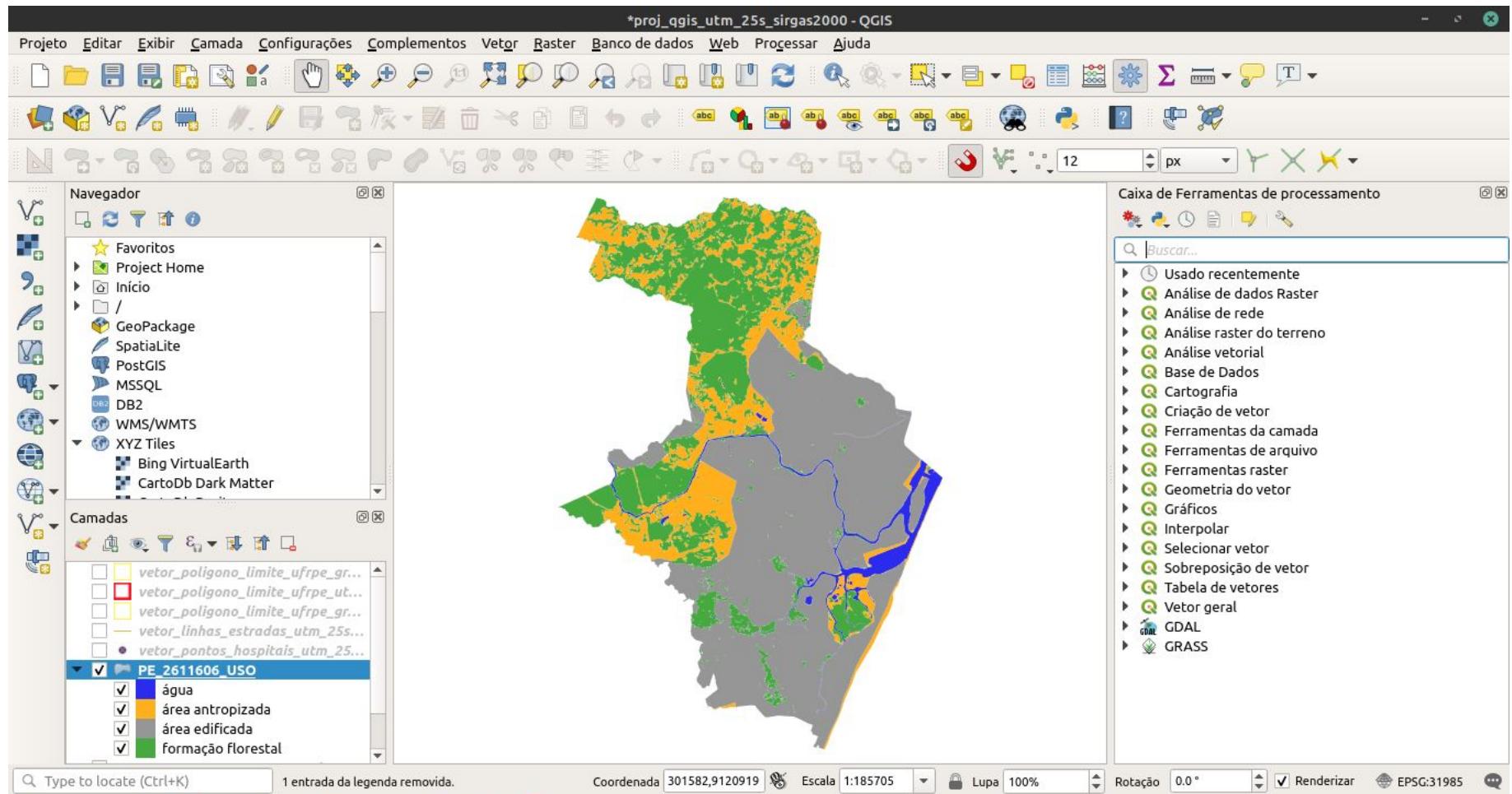
# 7.6 Propriedades de dados vetoriais

## Carregar estilo da camada



# 7.6 Propriedades de dados vetoriais

## Simbologia



## 6.8 Tabela de atributos

# Relação entre a geometria e suas características

Example Attributes for Point Data

ID	Plot Size	Type	VegClass
1	40	Vegetation	Conifer
2	20	Vegetation	Deciduous
3	40	Vegetation	Conifer

Example Attributes for Line Data

ID	Type	Status	Maintenance
1	Road	Open	Year Round
2	Dirt Trail	Open	Summer
3	Road	Closed	Year Round

Example Attributes for Polygon Data

ID	Type	Class	Status
1	Herbaceous	Grassland	Protected
2	Herbaceous	Pasture	Open
3	Herbaceous / Woody	Grassland	Protected

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<https://www.neonscience.org/>

# 7.7 Tabela de atributos

## Abrir uma tabela e atributos

The screenshot shows the QGIS application interface with the title bar "proj\_qgis\_utm\_25s\_sirgas2000 - QGIS". The menu bar includes Projeto, Editar, Exibir, Camada, Configurações, Complementos, Vettor, Raster, Banco de dados, Web, Processar, and Ajuda. The toolbar contains various icons for file operations, selection, and analysis. The left sidebar includes the "Navegador" (Navigator) panel with sections for Favoritos, Início, GeoPackage, SpatiaLite, PostGIS, MSSQL, DB2, WMS/WMTS, XYZ Tiles, WCS, WFS, and OWS; and the "Camadas" (Layers) panel showing a checked layer named "PE\_2611606\_USO" which contains five categories: água, área antropizada, área edificada, and formação florestal. A central window displays the attribute table for the selected layer:

	GEOCODIGO	MUNICIPIO	UF	CD_UF	CLASSE_USO	AREA_HA
1	2611606.000...	RECIFE	PE	26	área antropiz...	4011.280000...
2	2611606.000...	RECIFE	PE	26	água	771.0570000...
3	2611606.000...	RECIFE	PE	26	formação flo...	5791.350000...
4	2611606.000...	RECIFE	PE	26	área edificada	11276.90000...

At the bottom, there is a search bar "Type to locate (Ctrl+K)", coordinate information "Coordenada 268798,9107966", scale "Escala 1:187581", a zoom button "Lupa", a rotation slider "Rotação 0.0°", a rendering button "Renderizar", and a projection setting "EPSG:31985".

## 6.9 Formato de arquivos vetoriais

### Shapefile

Formato fechado de arquivos vetoriais



**\*.shp:** contém as informações do desenho

**\*.dbf:** tabela que contém as informação sobre cada forma  
do desenho, como nome, endereço etc.

**\*.shx:** é um arquivo de índice que une .shp ao .dbf

**\*.prj:** contém as informações do sistema de coordenadas

SHP



SHX



PRJ



## 7.7 Tabela de atributos

### Selecionar feição

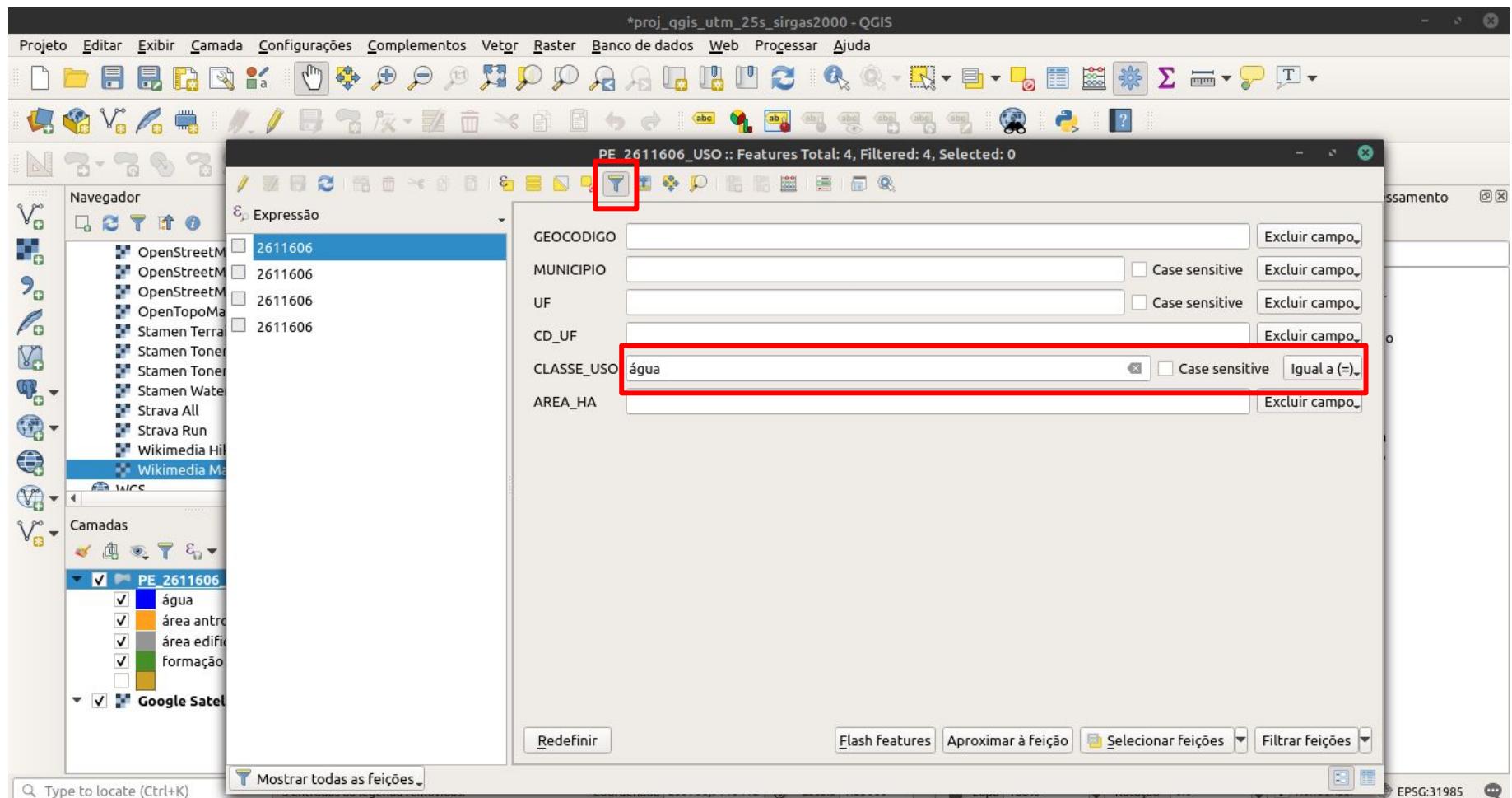
The screenshot shows the QGIS application interface with the title bar "\*proj\_qgis\_utm\_25s\_sirgas2000 - QGIS". The menu bar includes Projeto, Editar, Exibir, Camada, Configurações, Complementos, Vettor, Raster, Banco de dados, Web, Processar, and Ajuda. The toolbar contains various geoprocessing tools. The left sidebar includes the Navegador (Favorites, Início, GeoPackage, SpatiaLite, PostGIS, MSSQL, DB2, WMS/WMTS, XYZ Tiles, WCS, WFS, OWS) and Camadas (PE\_2611606\_USO layer with sub-categories: água, área antropizada, área edificada, formação florestal). A central table window titled "PE\_2611606\_USO :: Features Total: 4, Filtered: 4, Selected: 1" displays the following data:

	GEOCODIGO	MUNICIPIO	UF	CD_UF	CLASSE_USO	AREA_HA
1	2611606.000...	RECIFE	PE	26	área antropiz...	4011.28000...
2	2611606.000...	RECIFE	PE	26	água	771.057000...
3	2611606.000...	RECIFE	PE	26	formação flo...	5791.350000...
4	2611606.000...	RECIFE	PE	26	área edificada	11276.90000...

The status bar at the bottom shows: Type to locate (Ctrl+K), 1 feição selecionadas na camada PE\_2611606\_USO., Coordenada 268798,9107966, Escala 1:187581, Lupa 100%, Rotação 0.0°, Renderizar, EPSG:31985.

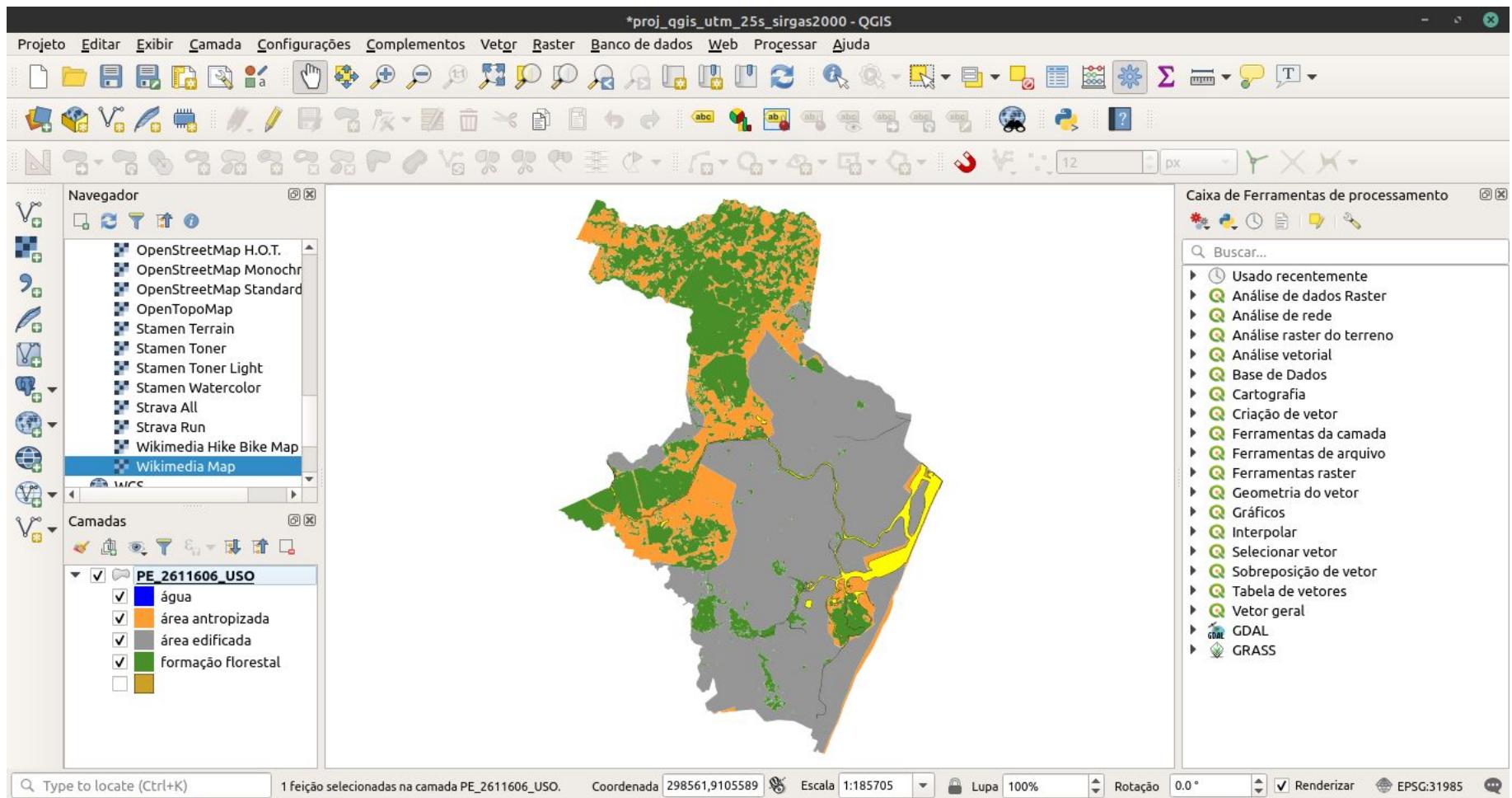
# 7.7 Tabela de atributos

## Filtrar feição



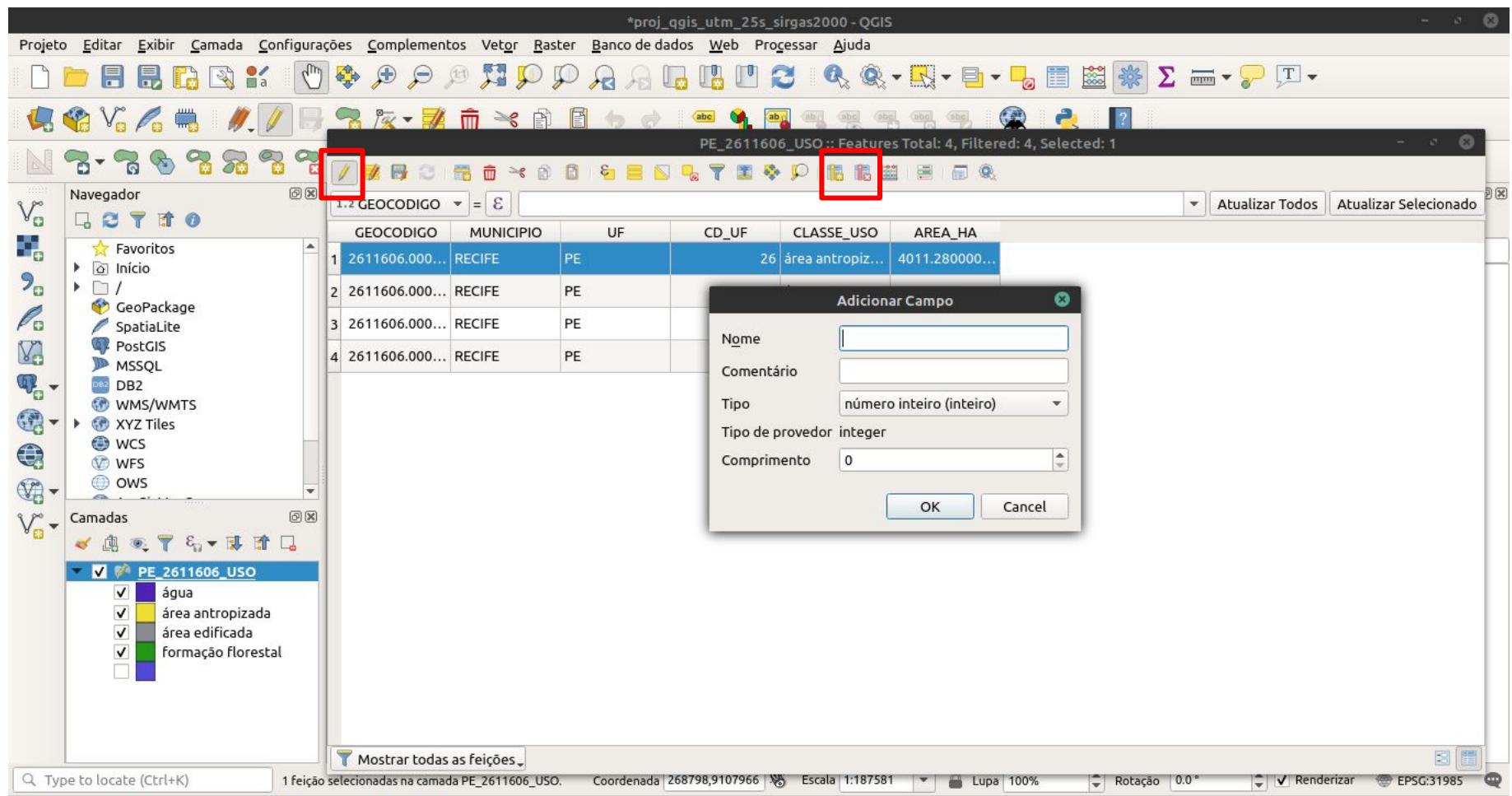
# 7.7 Tabela de atributos

## Filtrar feição



## 7.7 Tabela de atributos

### Adicionar e deletar campos (colunas)



# 7.8 Tabela de atributos - cálculos

## Cálculos na tabela de atributos

The screenshot shows the QGIS interface with the title bar "proj\_qgis\_utm\_25s\_sirgas2000 - QGIS". The menu bar includes Projeto, Editar, Exibir, Camada, Configurações, Complementos, Vettor, Raster, Banco de dados, Web, Processar, and Ajuda. The toolbar has various icons for file operations, selection, and analysis. The status bar at the bottom shows "Mostrar todas as feições.", "1 feição selecionadas na camada PE\_2611606\_USO.", "Coordenada 268798,9107966", "Escala 1:187581", "Lupa 100%", "Rotação 0.0°", "Renderizar", and "EPSG:31985".

The central feature is the attribute table for the layer "PE\_2611606\_USO". The table has columns: GEOCODIGO, MUNICIPIO, UF, CD\_UF, CLASSE\_USO, and AREA\_HA. The rows show the following data:

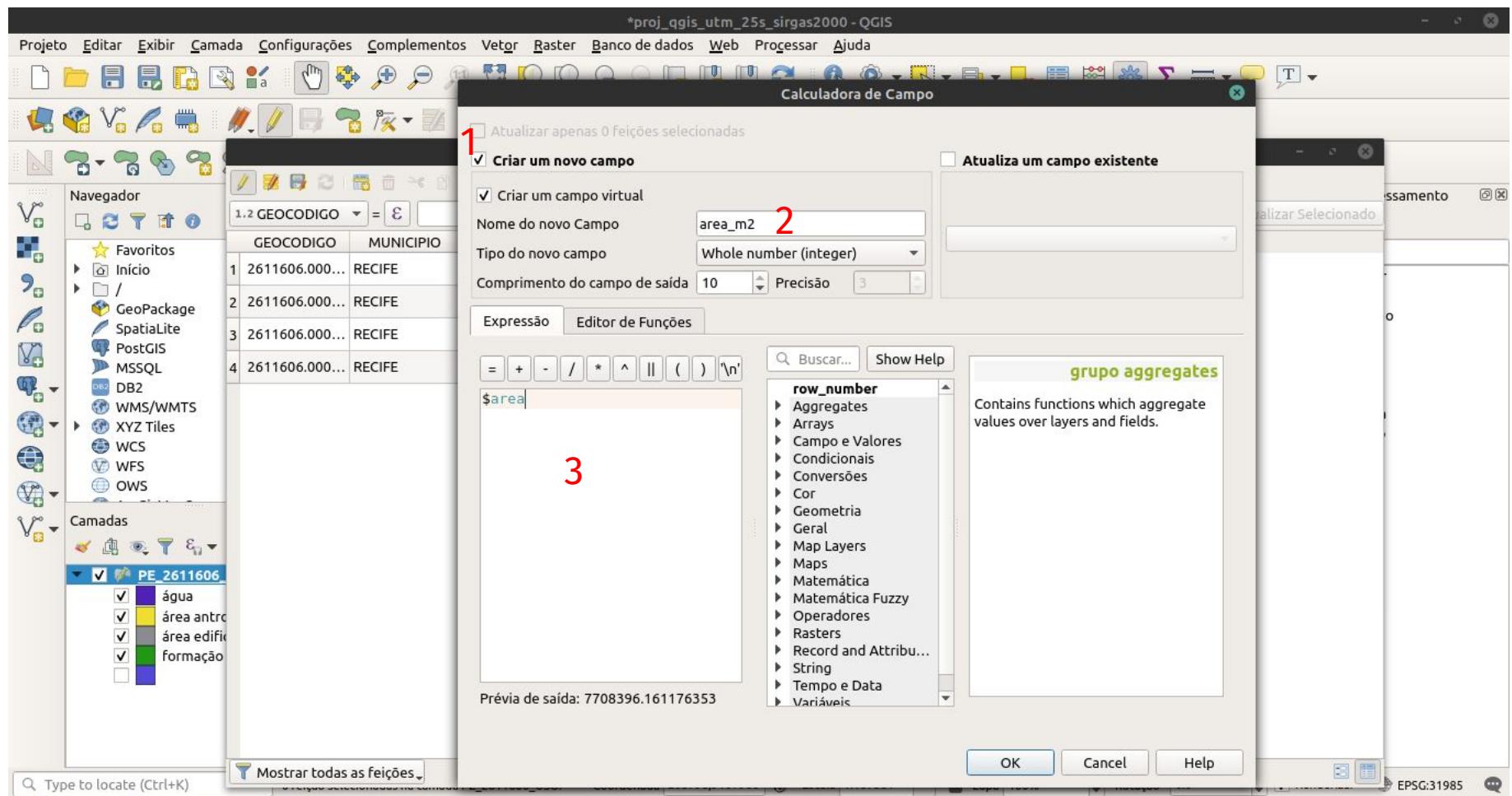
	GEOCODIGO	MUNICIPIO	UF	CD_UF	CLASSE_USO	AREA_HA
1	2611606.000...	RECIFE	PE	26	área antropiz...	4011.28000...
2	2611606.000...	RECIFE	PE	26	água	771.057000...
3	2611606.000...	RECIFE	PE	26	formação flo...	5791.350000...
4	2611606.000...	RECIFE	PE	26	área edificada	11276.90000...

The attribute table window has two red boxes highlighting the "New Row" icon (pencil) and the "Delete Row" icon (trash can).

The left sidebar shows the "Navegador" (Favorites, Home, etc.) and "Camadas" (layers) panel. The "PE\_2611606\_USO" layer is selected, showing categories: água, área antropizada, área edificada, and formação florestal.

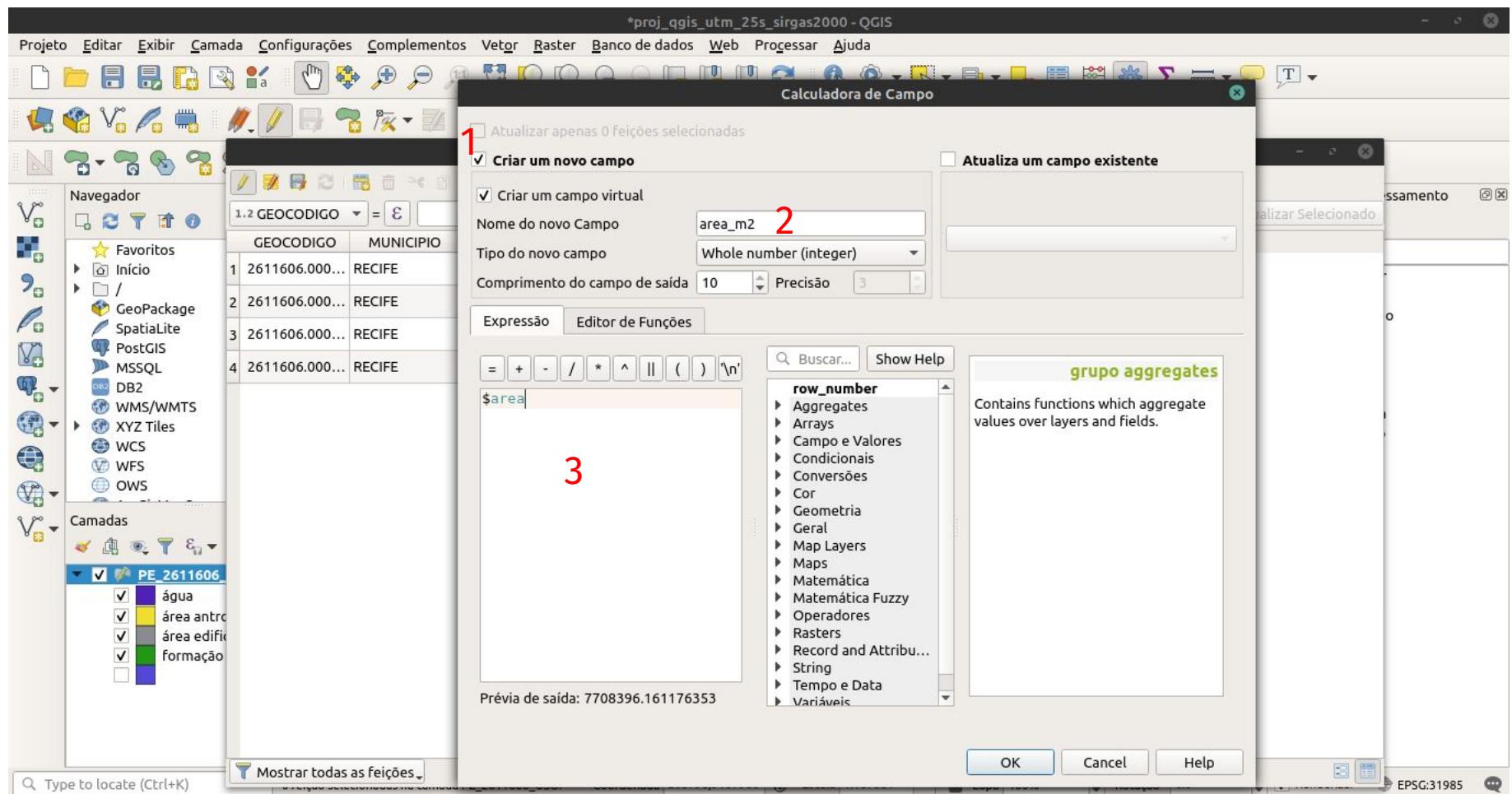
# 7.8 Tabela de atributos - cálculos

## Pontos - extrair coordenadas (\$x e \$y)



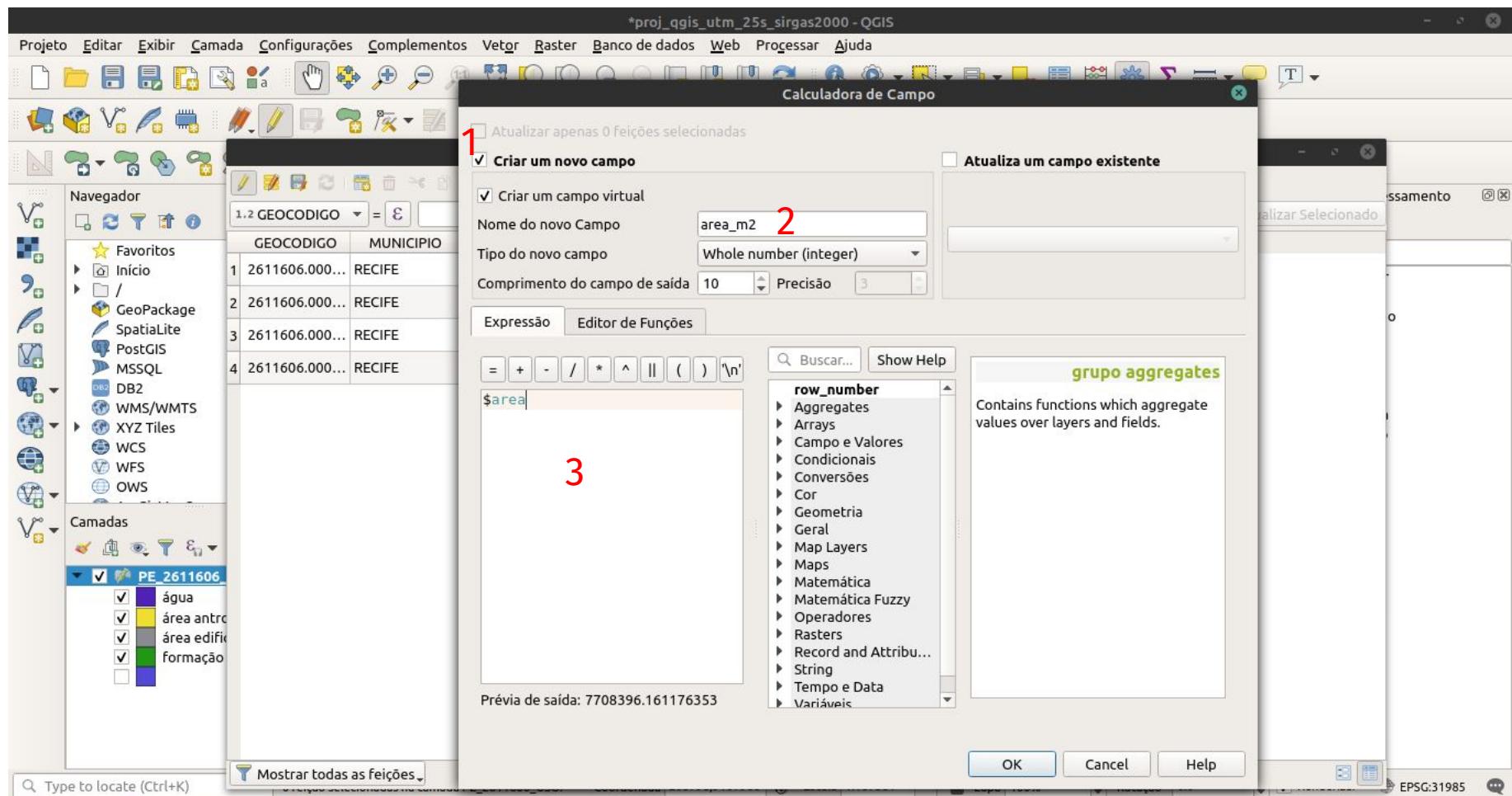
# 7.8 Tabela de atributos - cálculos

## Linha - distância (\$distance)



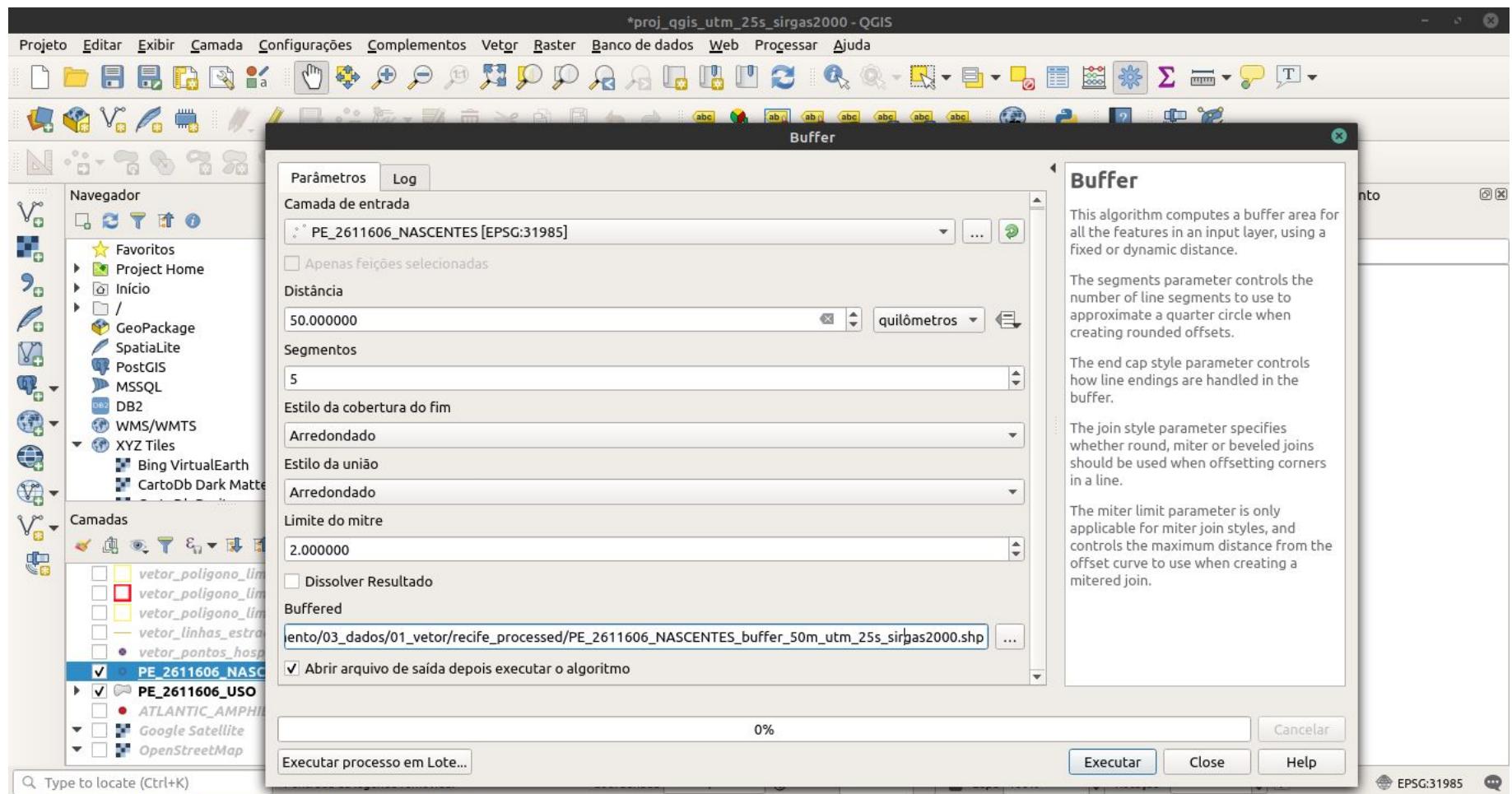
## 7.8 Tabela de atributos - cálculos

### Polígono - área (\$area) e perímetro (\$perimeter)



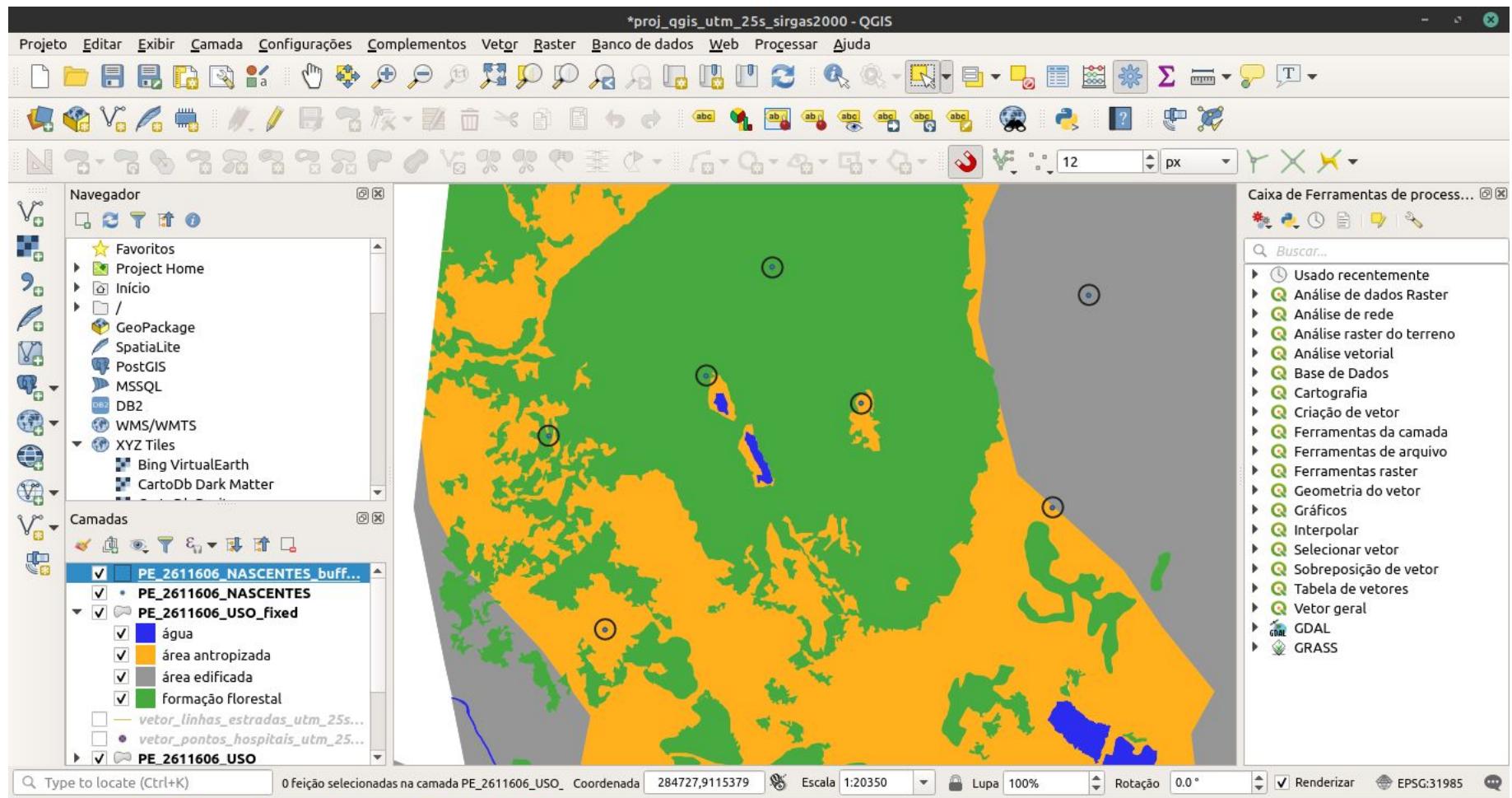
# 7.9 Geoprocessamento de dados vetoriais

## Buffer



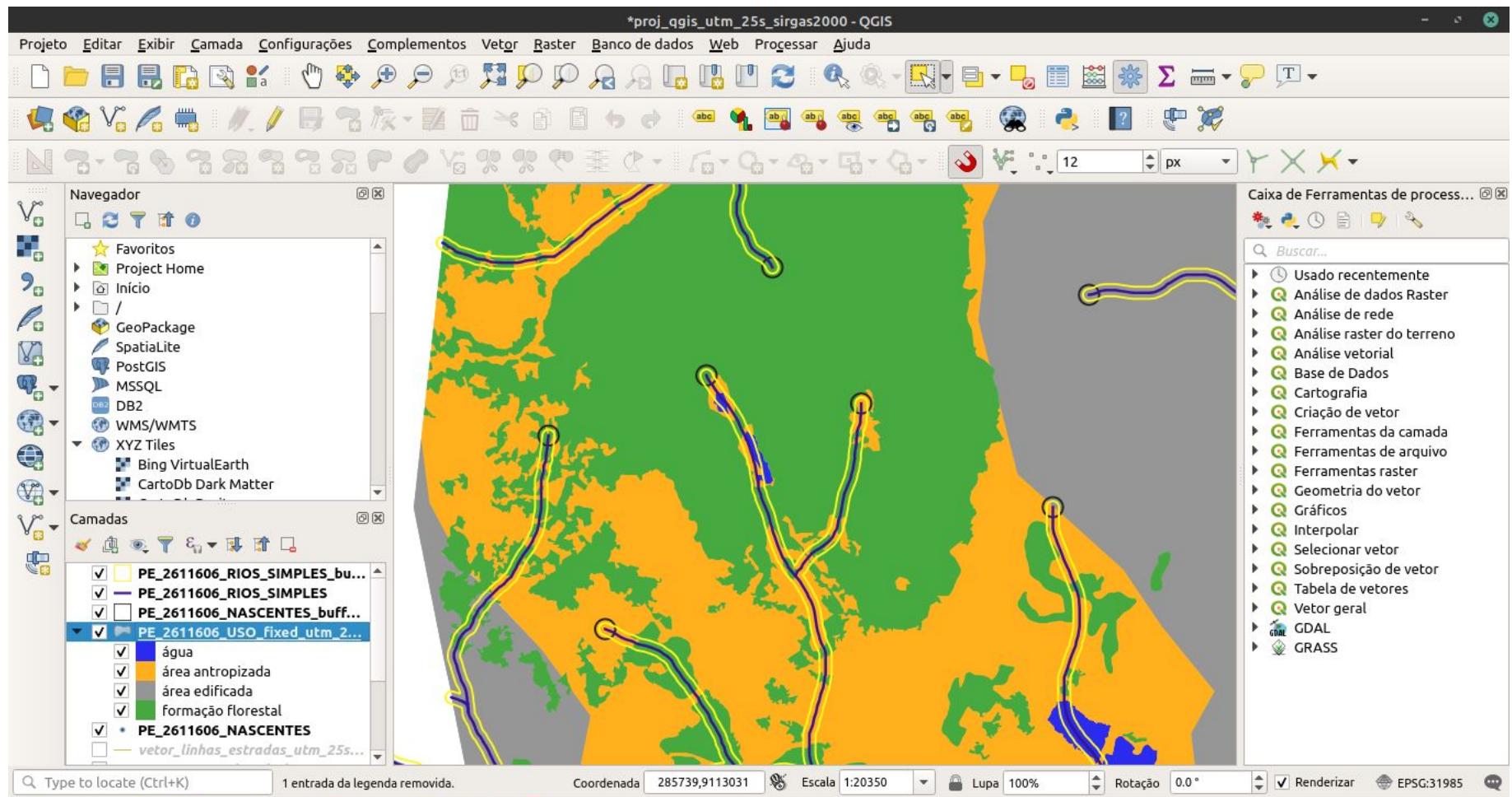
# 7.9 Geoprocessamento de dados vetoriais

## Buffer



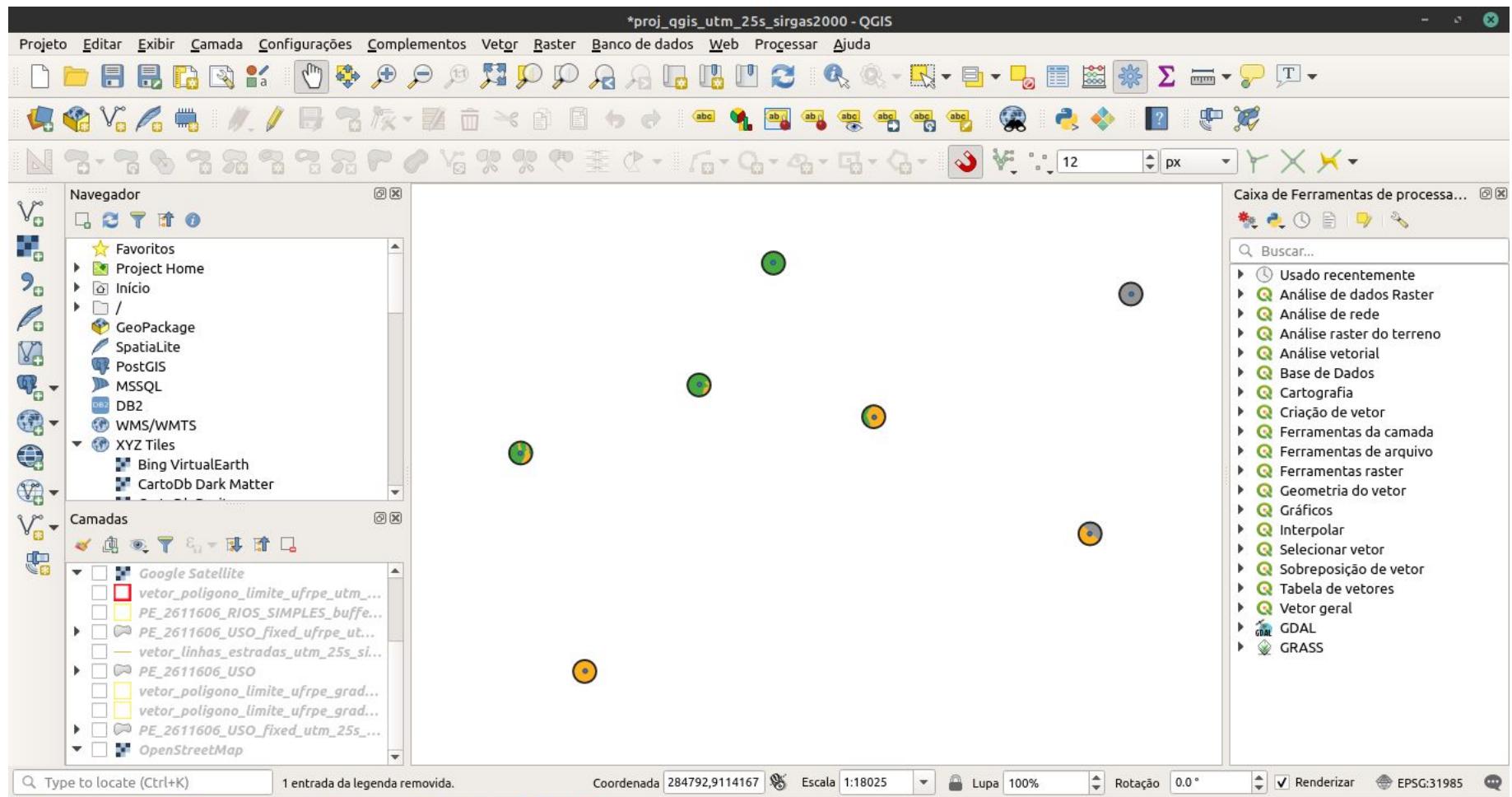
# 7.9 Geoprocessamento de dados vetoriais

## Buffer



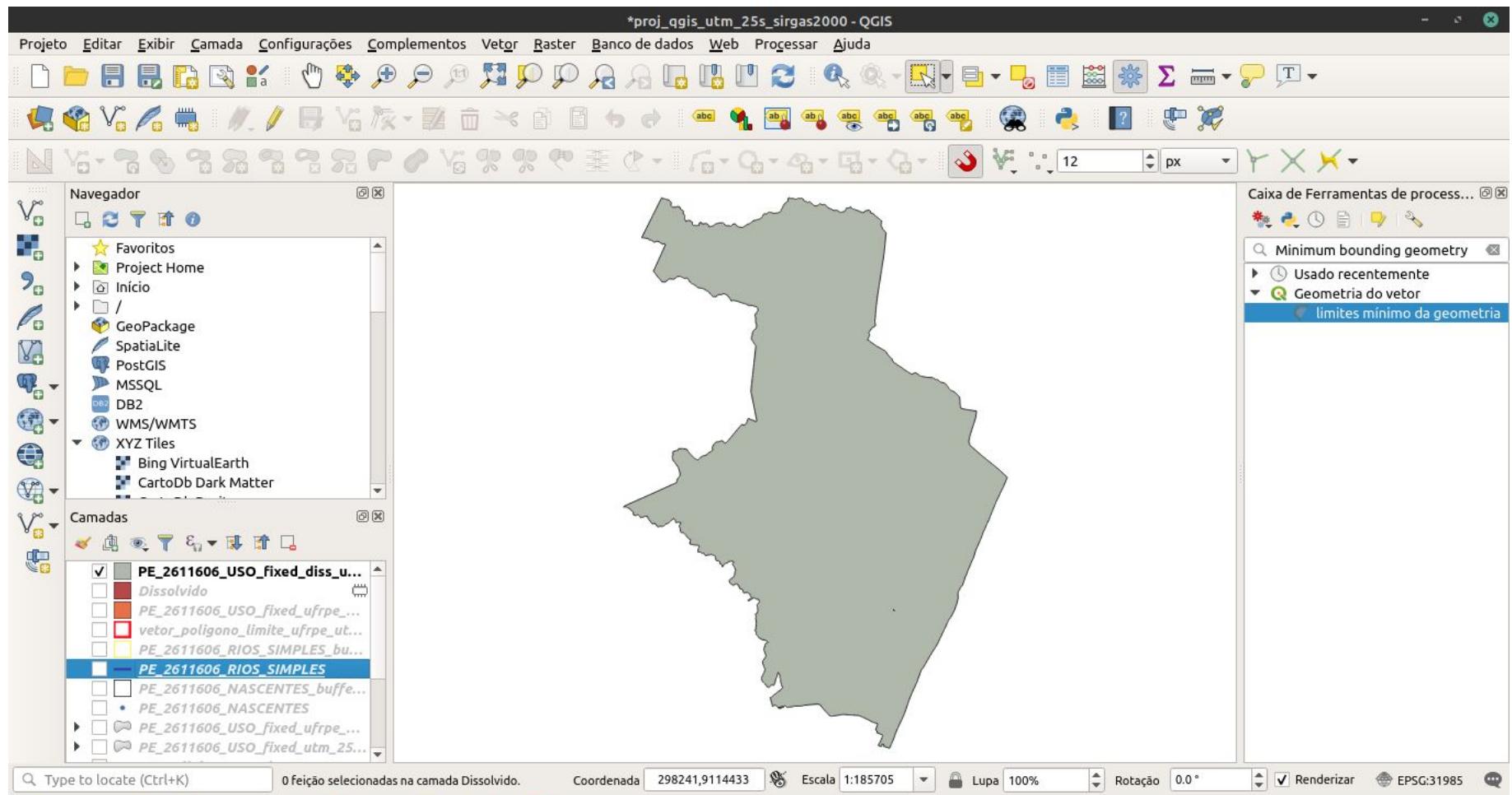
# 7.9 Geoprocessamento de dados vetoriais

## Recortar



# 7.9 Geoprocessamento de dados vetoriais

## Dissolver

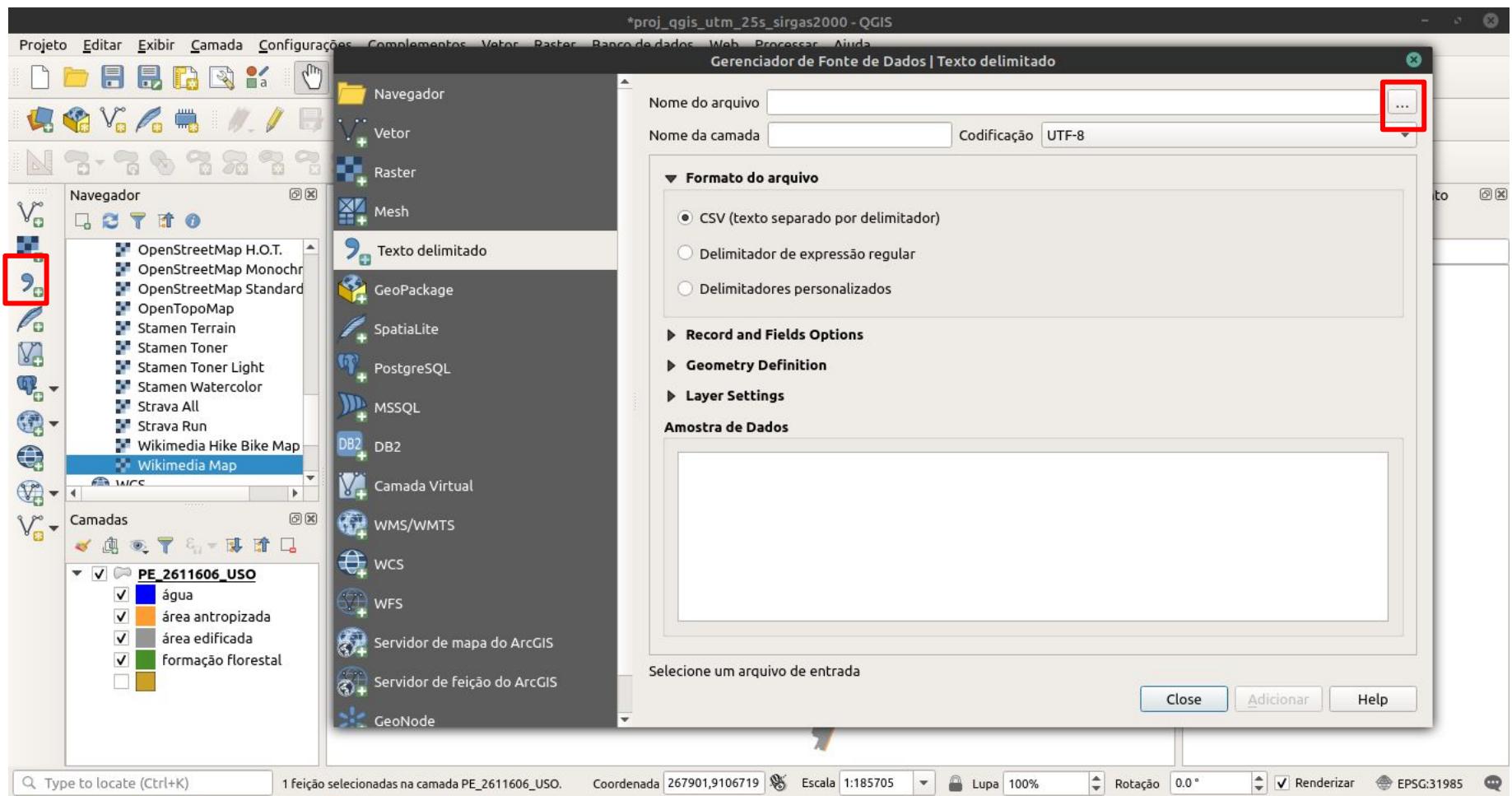


## 7.10 Criação de dados vetoriais

E como criar um vetor?

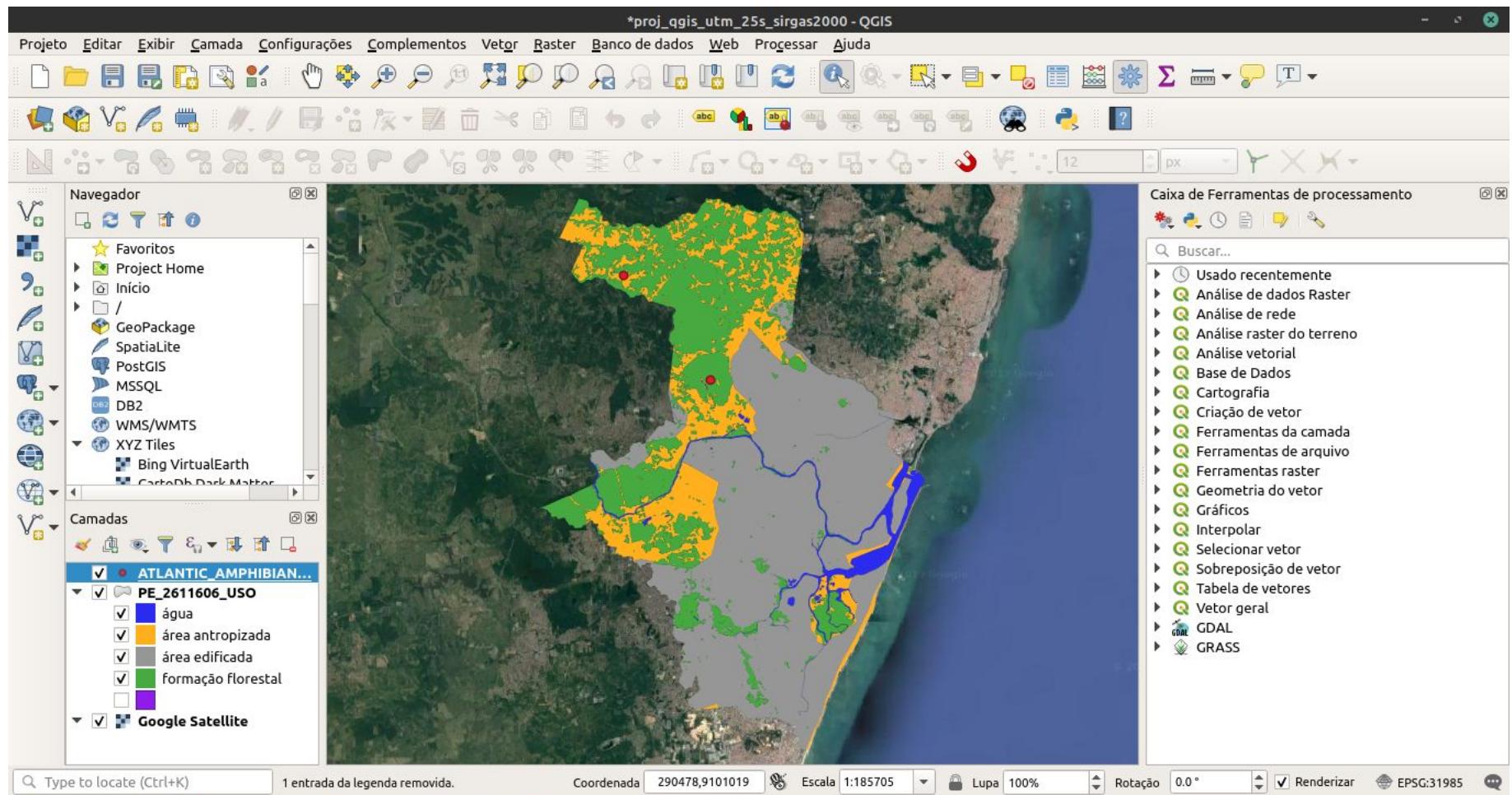
# 7.10 Criação de dados vetoriais

## Adicionar um vetor de pontos de um .csv



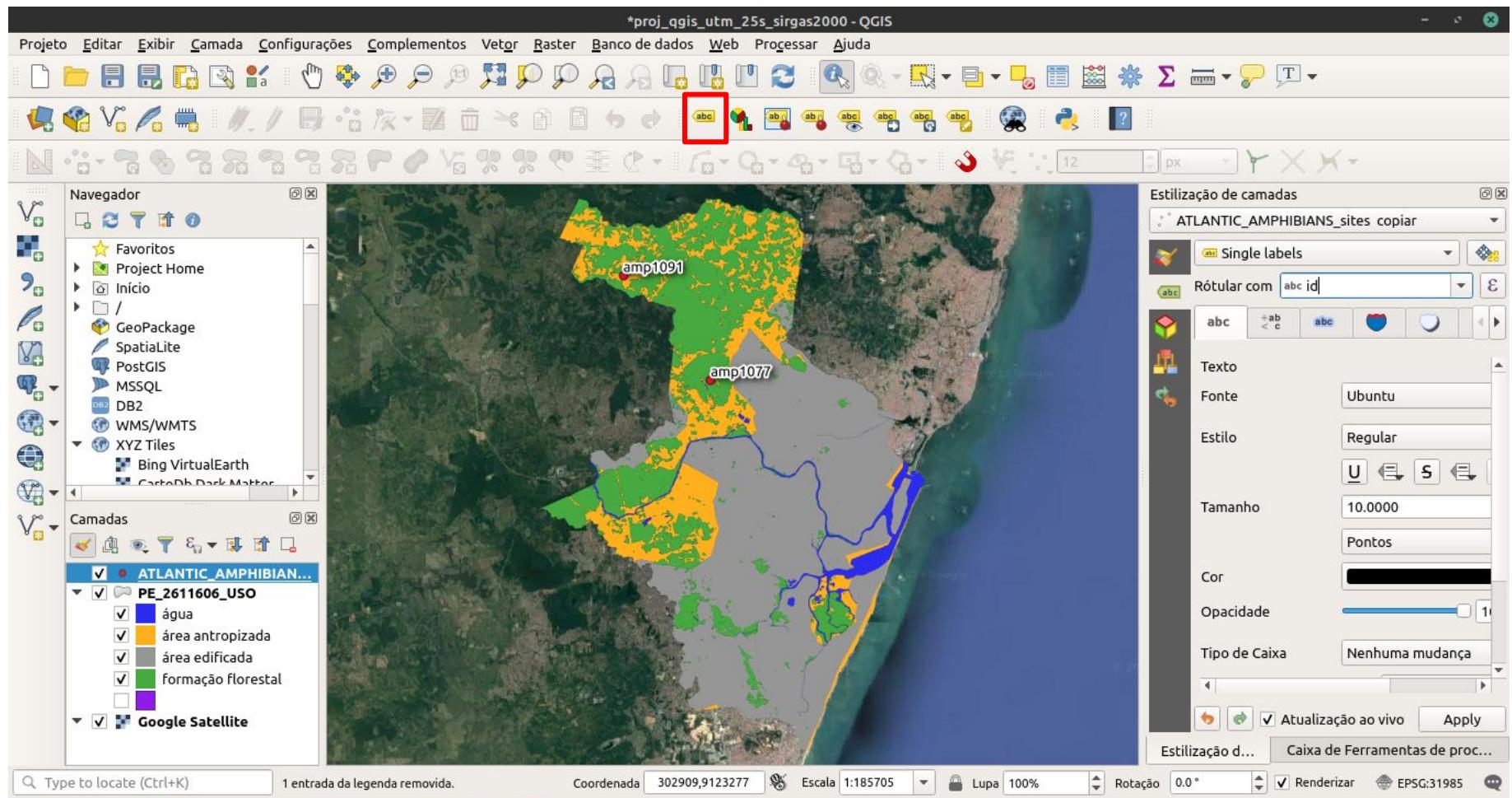
# 7.10 Criação de dados vetoriais

## Adicionar um vetor de pontos de um .csv



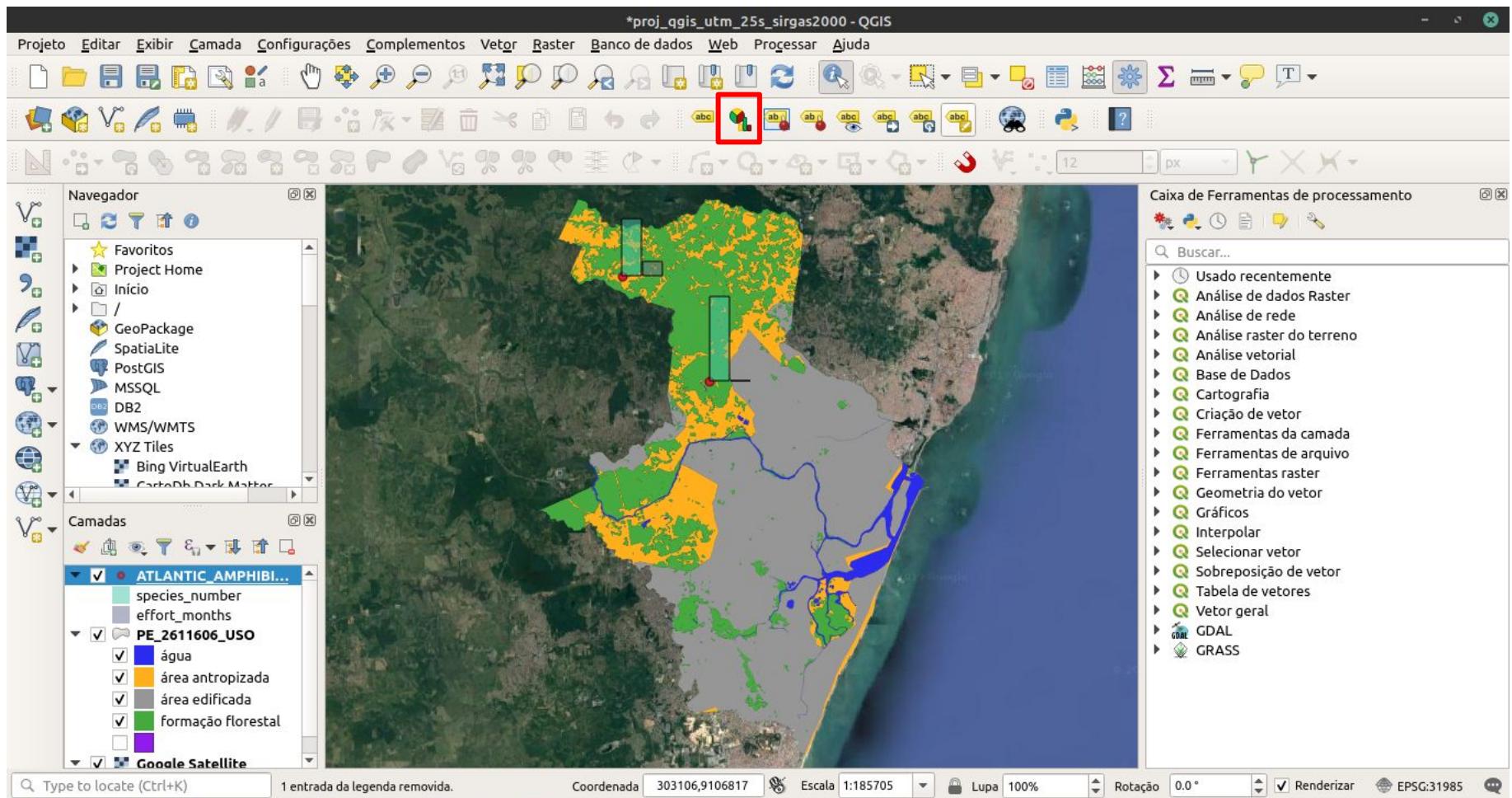
# 7.10 Criação de dados vetoriais

## Rótulos



# 7.10 Criação de dados vetoriais

## Diagrams



# 7.10 Criação de dados vetoriais

## Adicionar um vetor de pontos de um .gpx



Screenshot of QGIS 2.18.13 "SIRGAS2000" showing the "Complementos" (Plugins) window open. The "Instalados" (Installed) tab is selected, displaying a list of installed plugins. The "Captura de coordenadas" plugin is highlighted, showing its details: "This is a core plugin, so you can't uninstall it", "Captura de coordenadas", "Capturar coordenadas do mouse em um diferente SRC", "Categoria: Vetor", and "Installed version: Versão 0.1".

The QGIS interface includes a toolbar with various tools, a legend on the left, and a map view at the bottom. The status bar at the bottom shows coordinates, scale, and other metadata.

**Complementos | Instalados (11)**

This is a core plugin, so you can't uninstall it

**Captura de coordenadas**

Capturar coordenadas do mouse em um diferente SRC

Categoria: Vetor  
Installed version: Versão 0.1

Upgrade All Uninstall Plugin Reiniciar complemento Close Help

# 7.10 Criação de dados vetoriais

## Criar um vetor dados de GPS (.gpx)



\*proj\_qgis\_utm\_25s\_sirgas2000 - QGIS

Projeto Editar Exibir Camada Configurações Complementos Vetor Raster Banco de dados Web Processar Ajuda

Navegador Caixa de Ferramentas de processamento

**Ferramentas GPS**

Carregar arquivo GPX Importar outro arquivo Descarregar do GPS Carregar no GPS Conversões GPX

Arquivo

Tipos de Feições  Waypoints

Rotas  
 Trilhas

OK Cancel Help

Type to locate (Ctrl+K) 1 entrada da legenda removida. Coordenada 271856,9123621 Escala 1:185705 Lupa 100% Rotação 0.0° Renderizar EPSG:31985

The screenshot shows the QGIS application interface. A red box highlights the 'Ferramentas GPS' (GPS Tools) icon in the toolbar. Another red box highlights the '...' button in the 'Ferramentas GPS' dialog window.

## 6.3 GPS

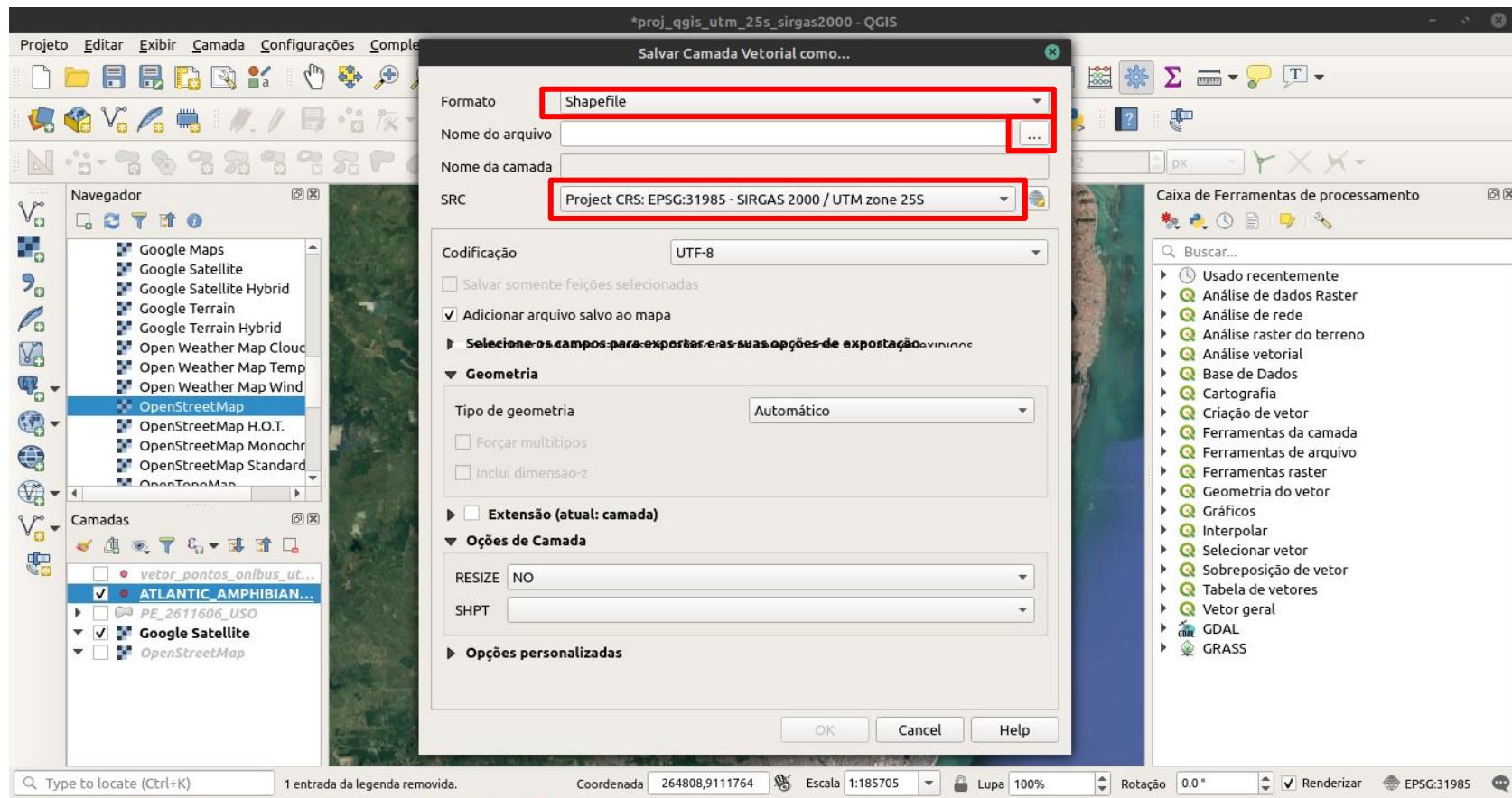
# Sistema de Posicionamento Global

1. **Waypoints:** ponto de interesse, contendo longitude, latitude e Longitude, elevação tempo, além de nome, descrição e outras propriedades
2. **Rotas:** sequência de waypoints, servindo conceitualmente como uma *sugestão* de trajetória entre os waypoints. Representa a possibilidade futura de navegação
3. **Trilhas:** sequência de trackpoints, representa a *trajetória* percorrida. Registro de eventos que foram ocorrendo ao longo do tempo

# 7.10 Criação de dados vetoriais

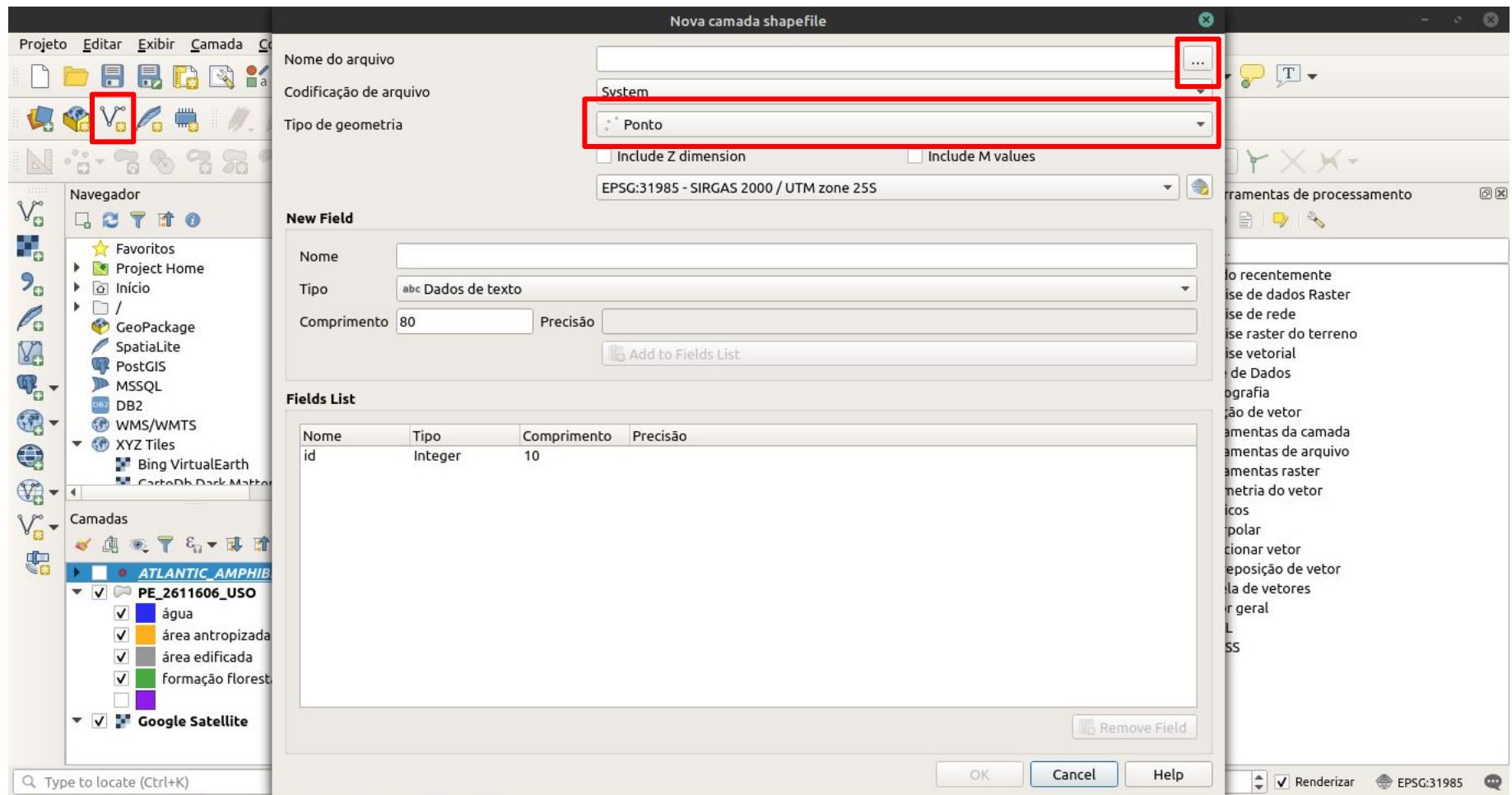
## Criar um vetor de .csv ou .gpx

Exportar > Salvar feições como...



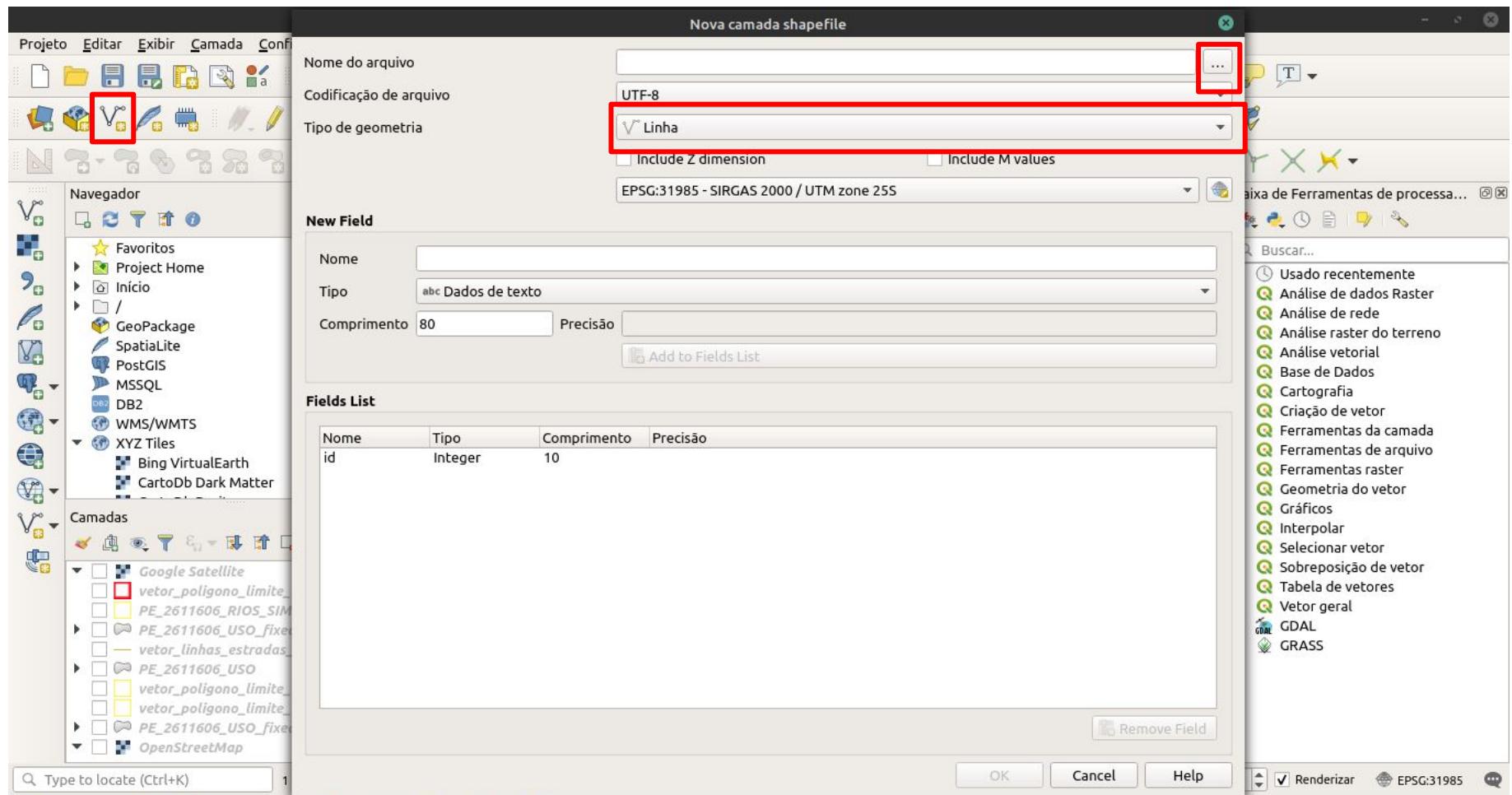
# 7.10 Criação de dados vetoriais

## Criar um vetor de pontos sem informações



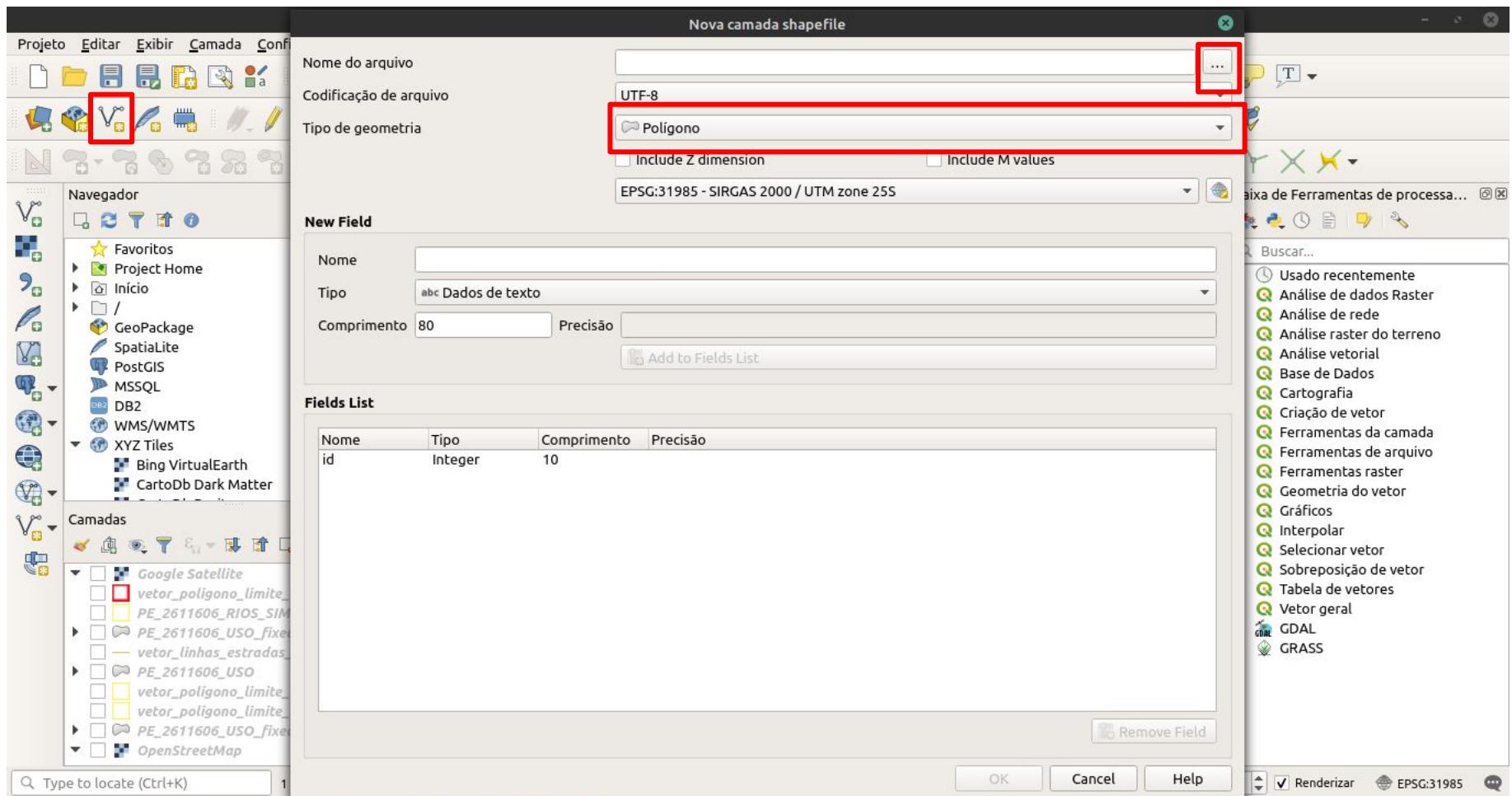
# 7.10 Criação de dados vetoriais

## Criar um vetor de linhas sem informações



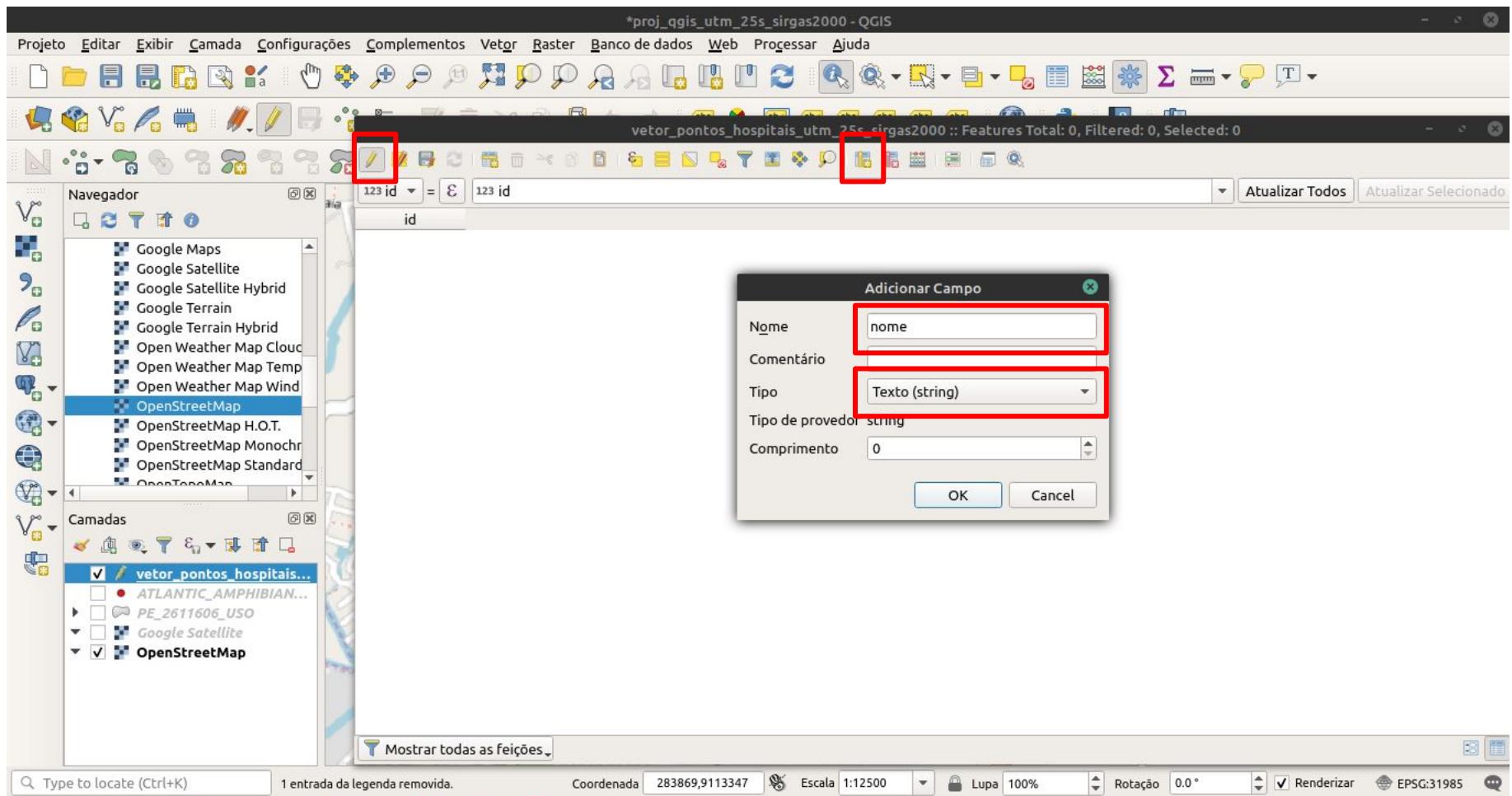
# 7.10 Criação de dados vetoriais

## Criar um vetor de polígonos sem informações



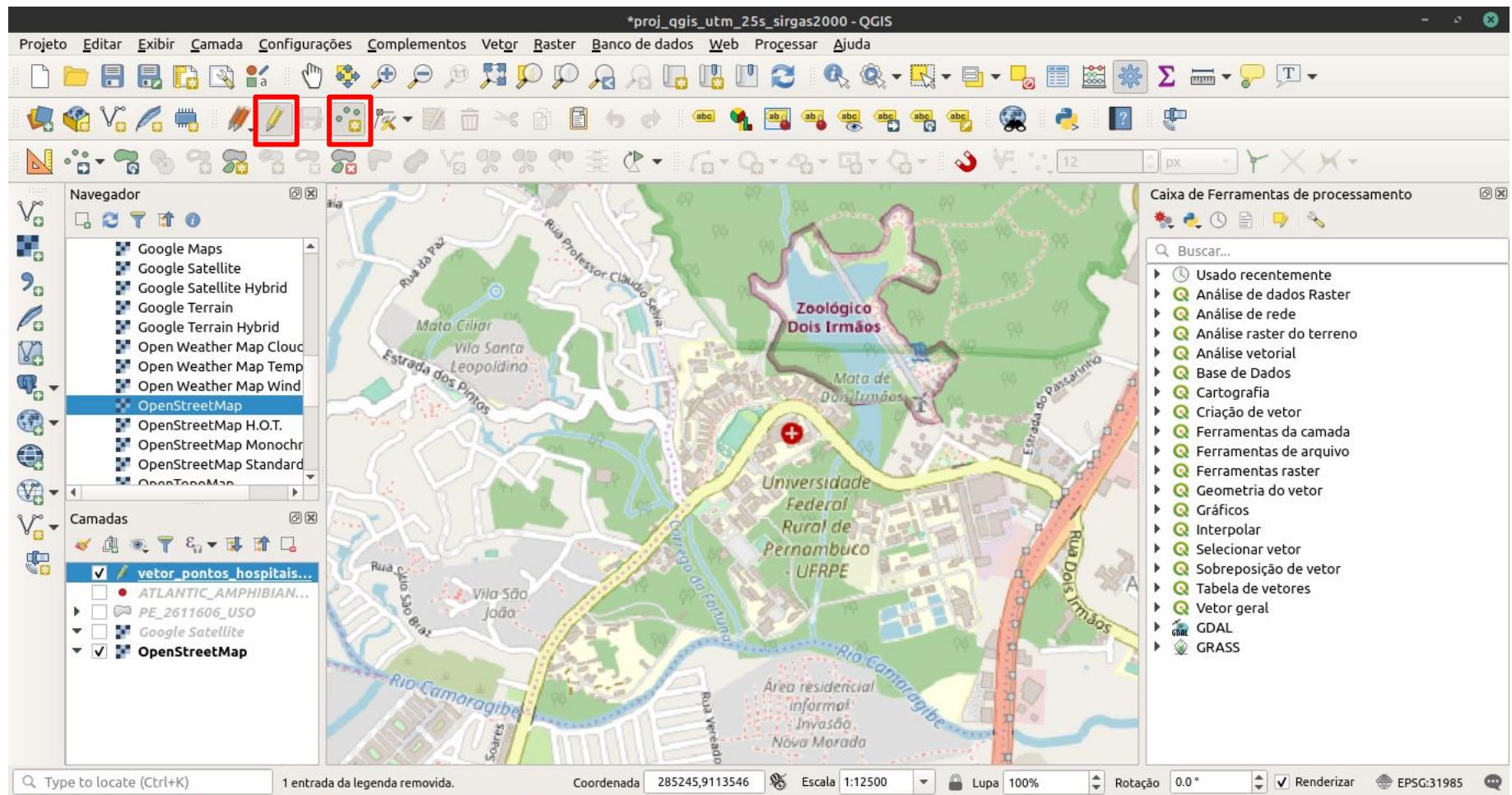
# 7.10 Criação de dados vetoriais

## Criar campos na tabela de atributos



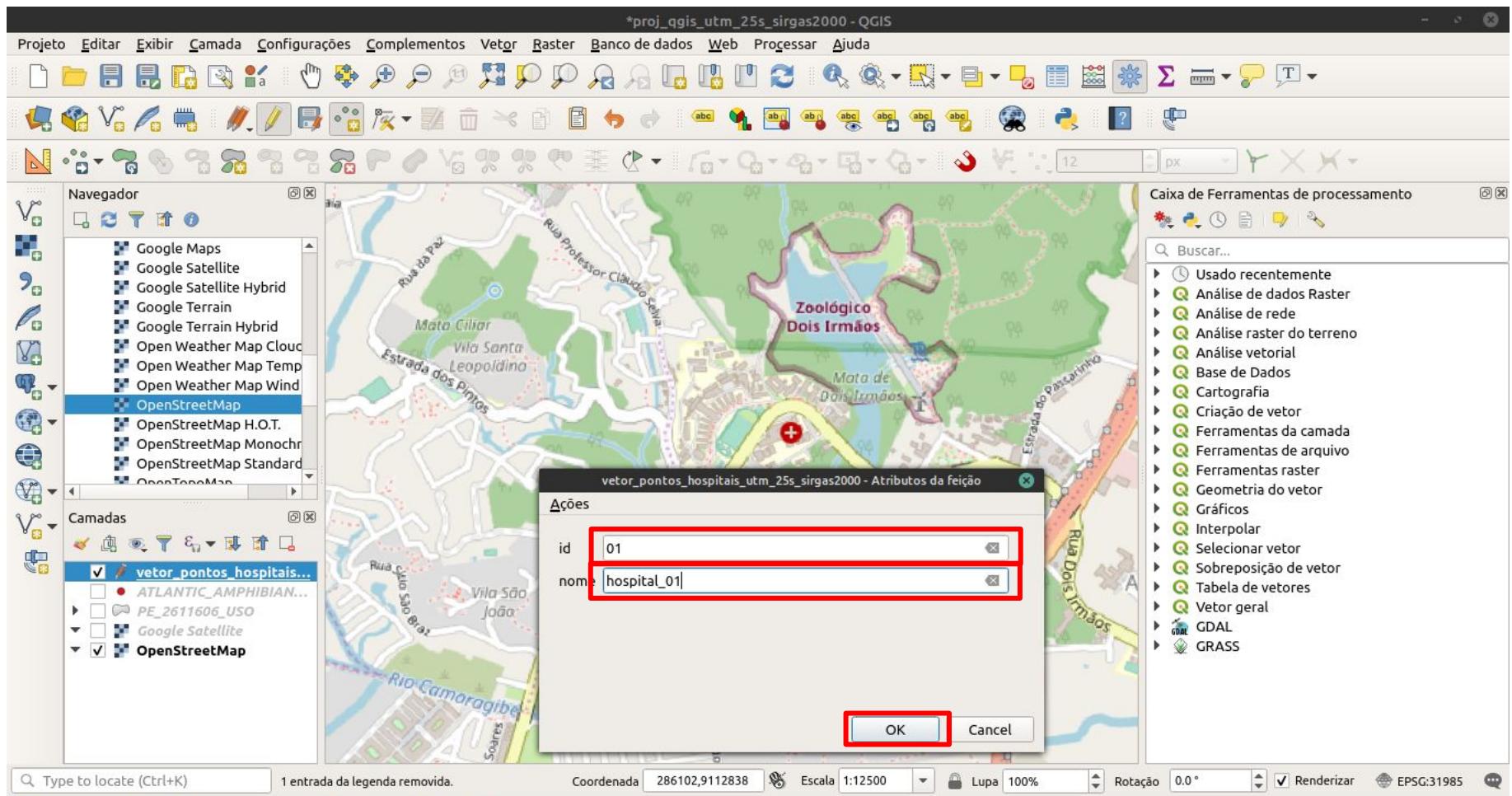
# 7.11 Edição de dados vetoriais

## Edição de pontos



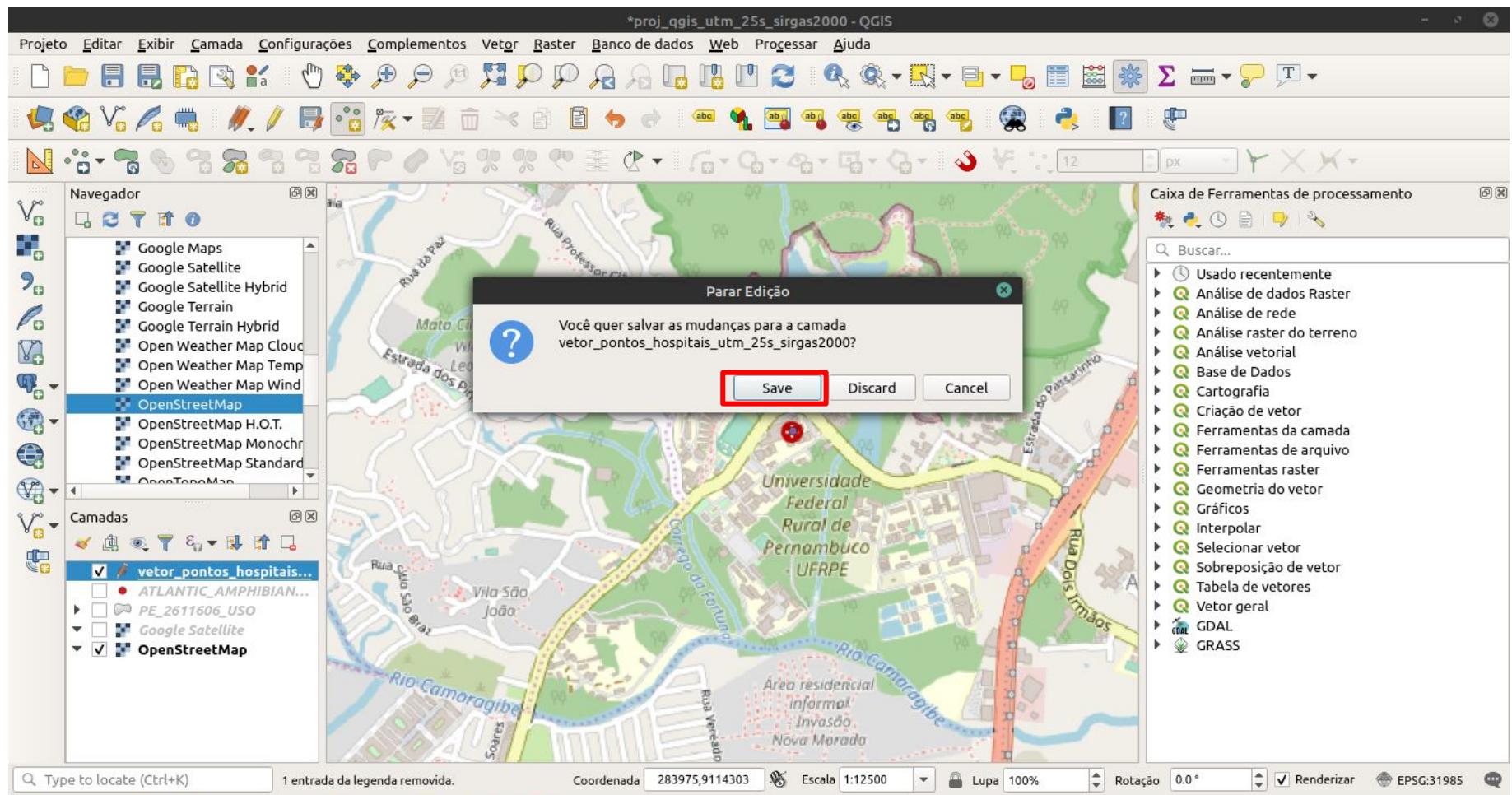
# 7.11 Edição de dados vetoriais

## Edição de pontos



## 7.11 Edição de dados vetoriais

# Edição de pontos

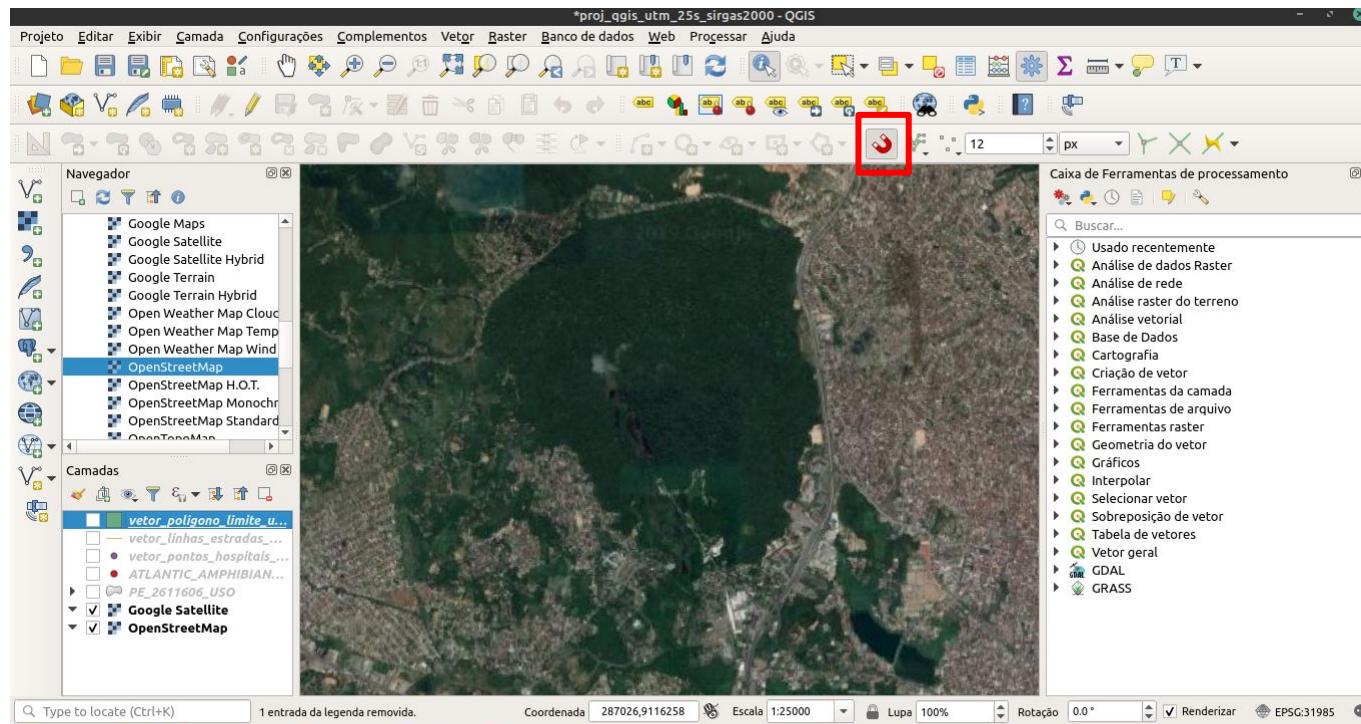


# 7.11 Edição de dados vetoriais

## Edição de linhas e polígonos

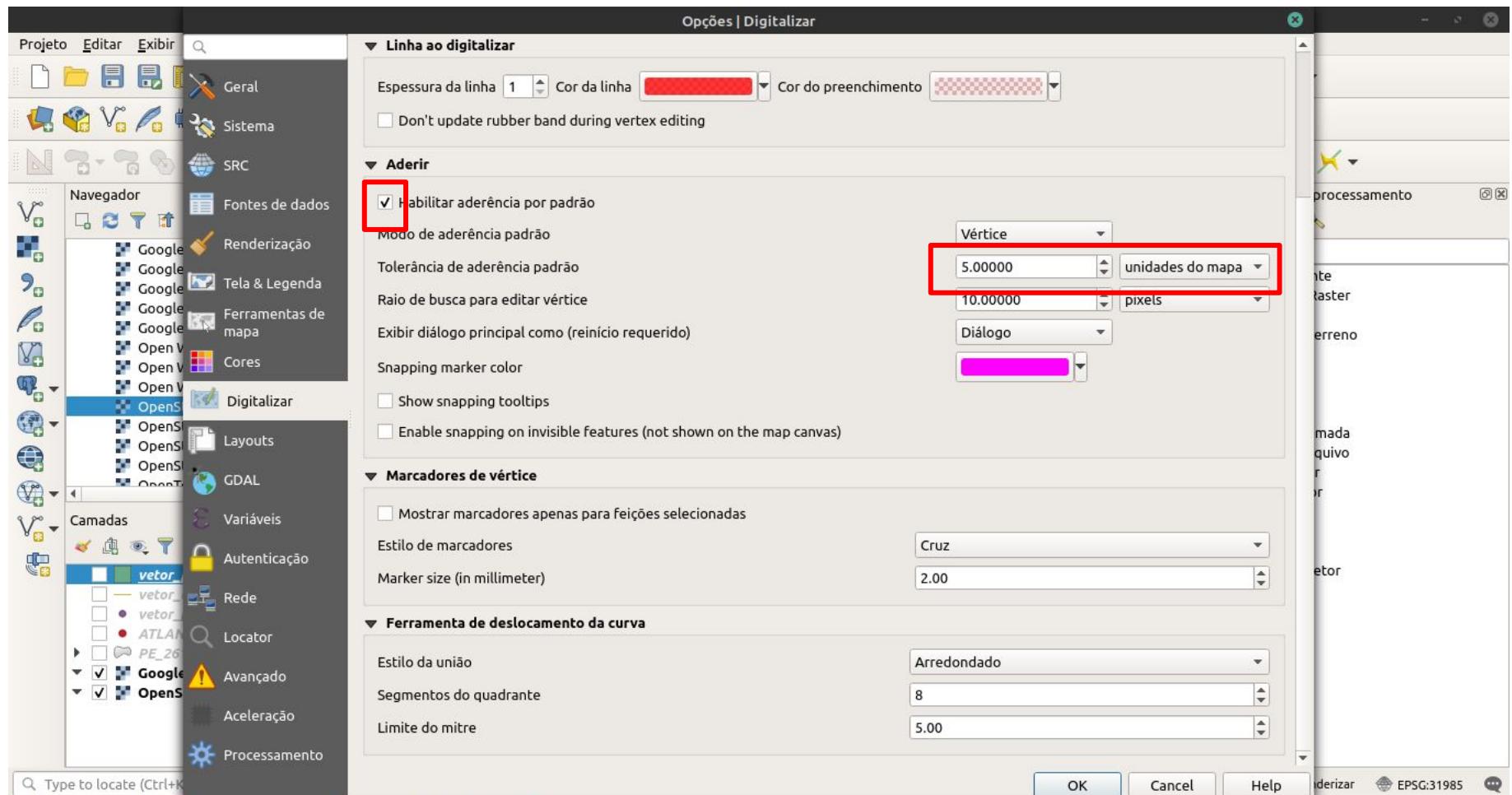
**IMPORTANTE!!!**

Ativar o “modo de aderência”



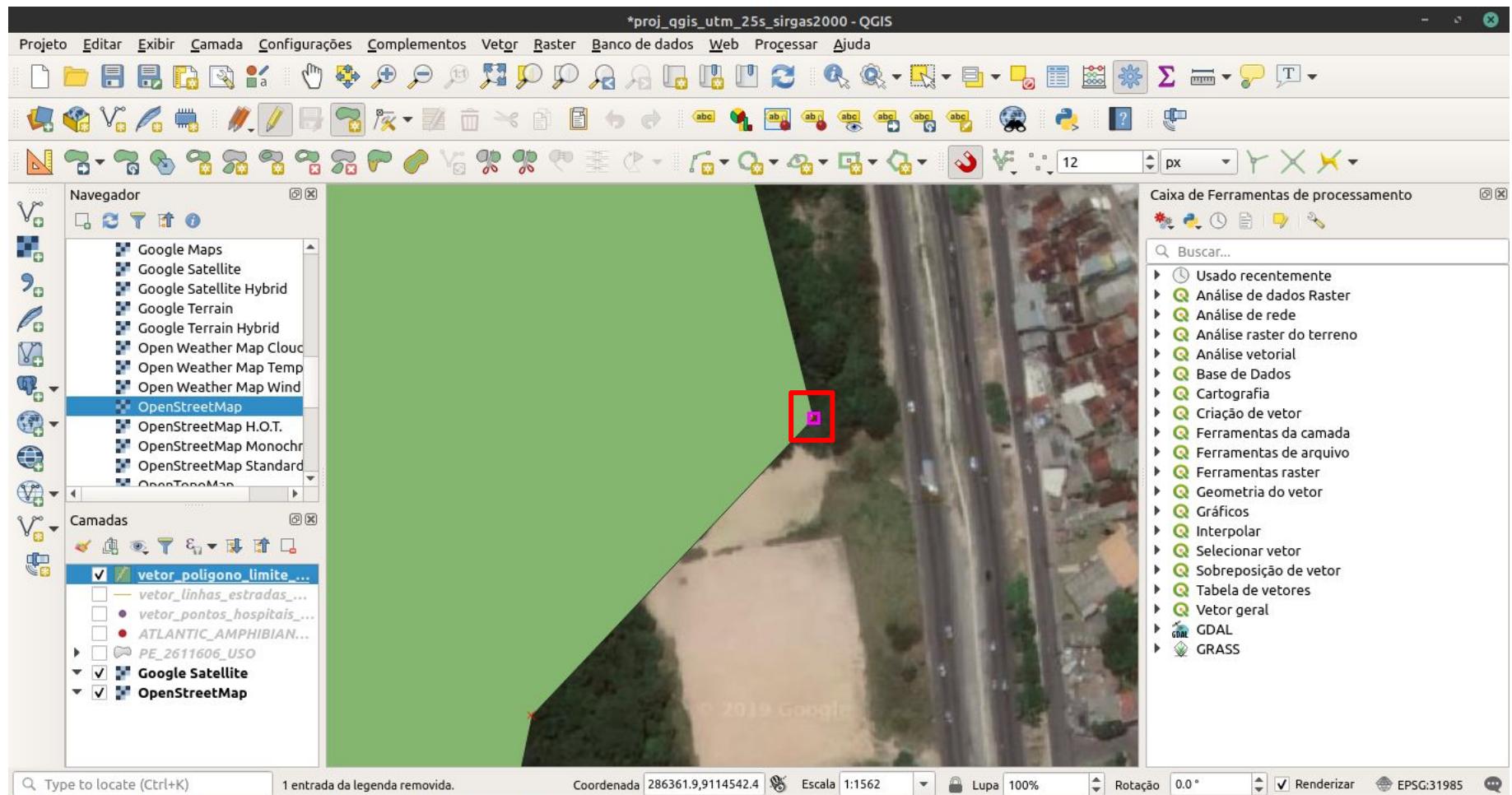
# 7.11 Edição de dados vetoriais

## Modo de aderência



# 7.11 Edição de dados vetoriais

## Modo de aderência (ligação entre vértices)



## 7.11 Edição de dados vetoriais

Edição de linhas e polígonos

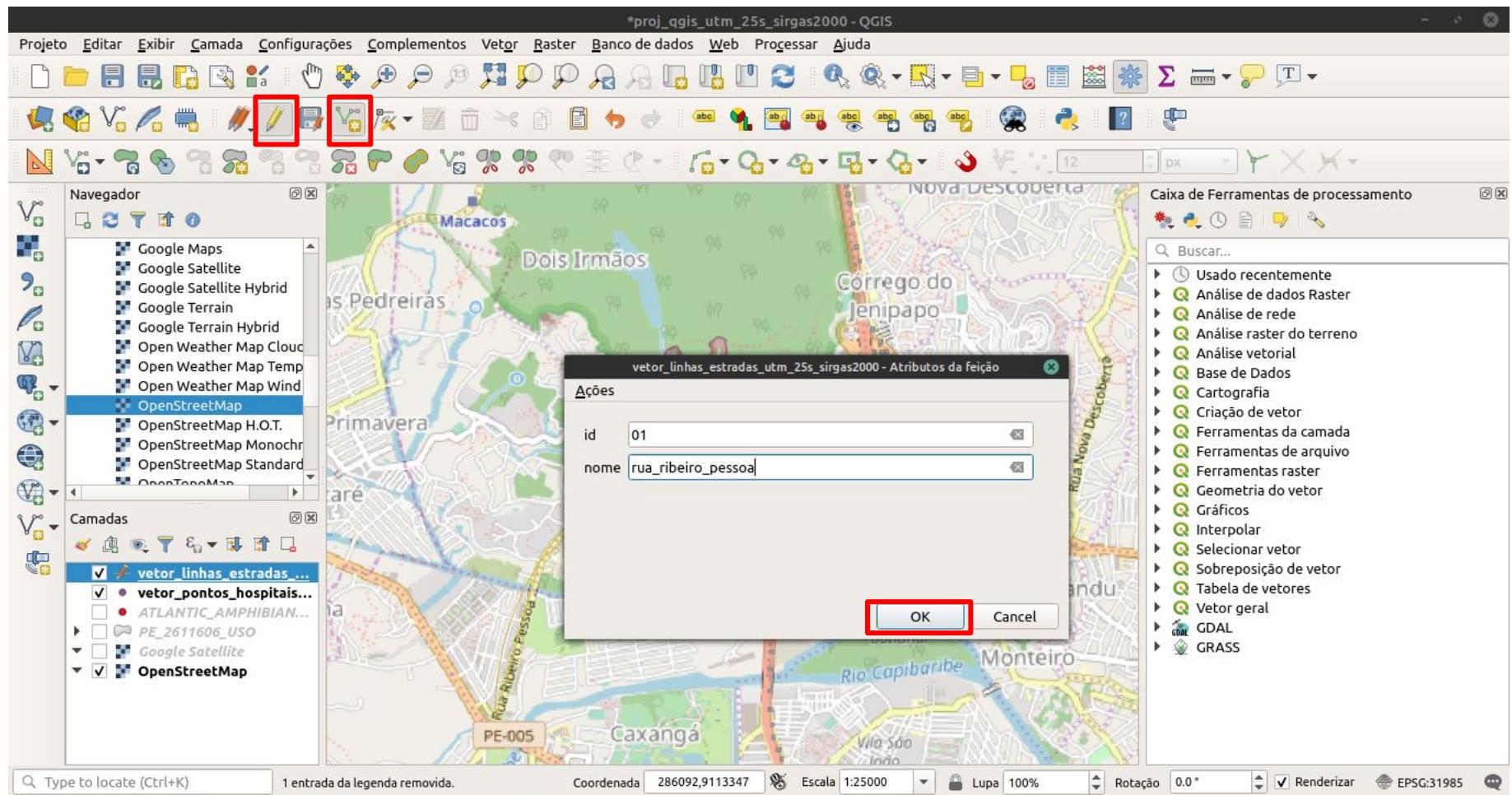
**IMPORTANTE!!!**

Botão esquerdo - desenha

Botão direito - finaliza

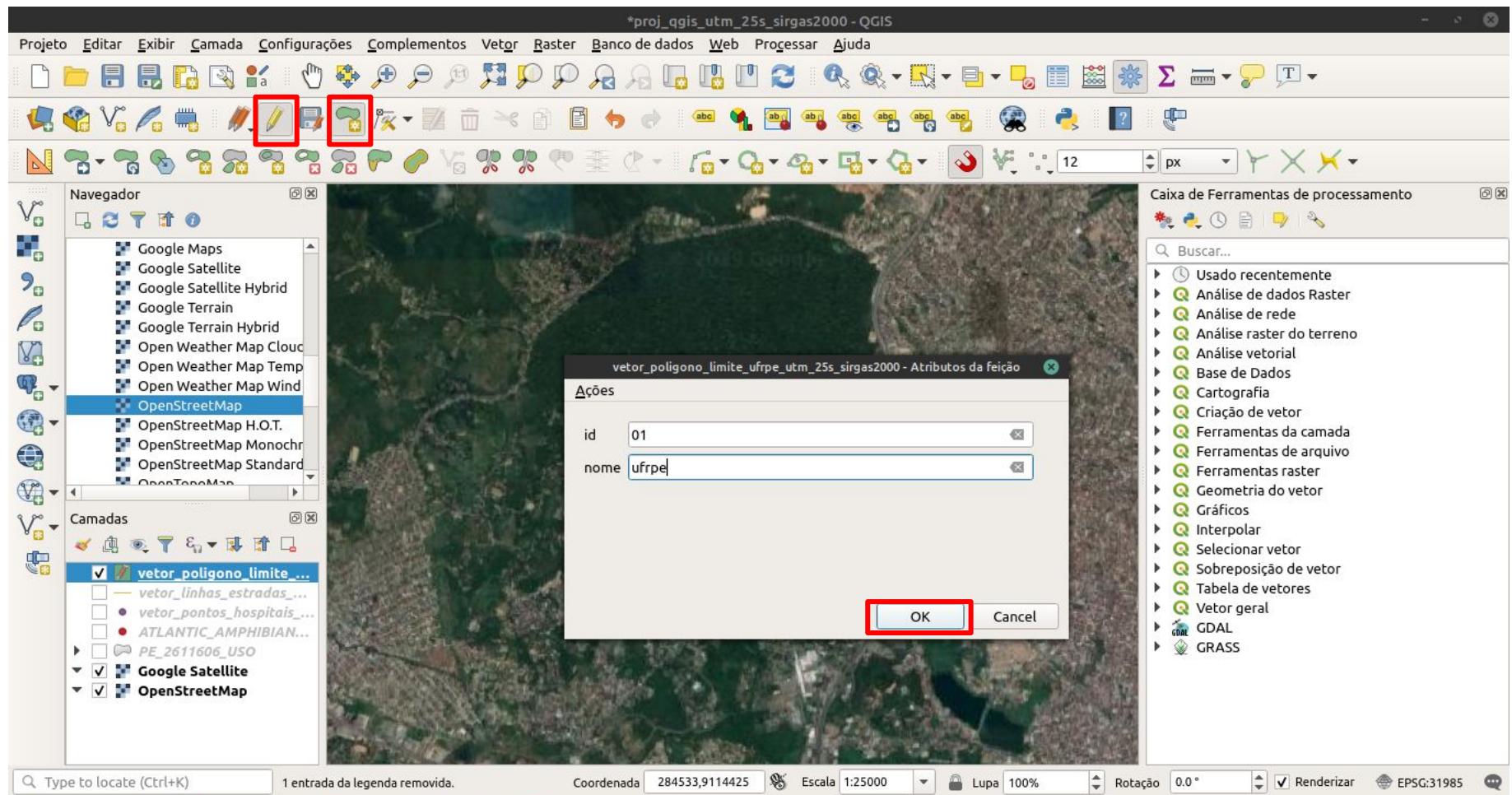
# 7.11 Edição de dados vetoriais

## Edição de linhas



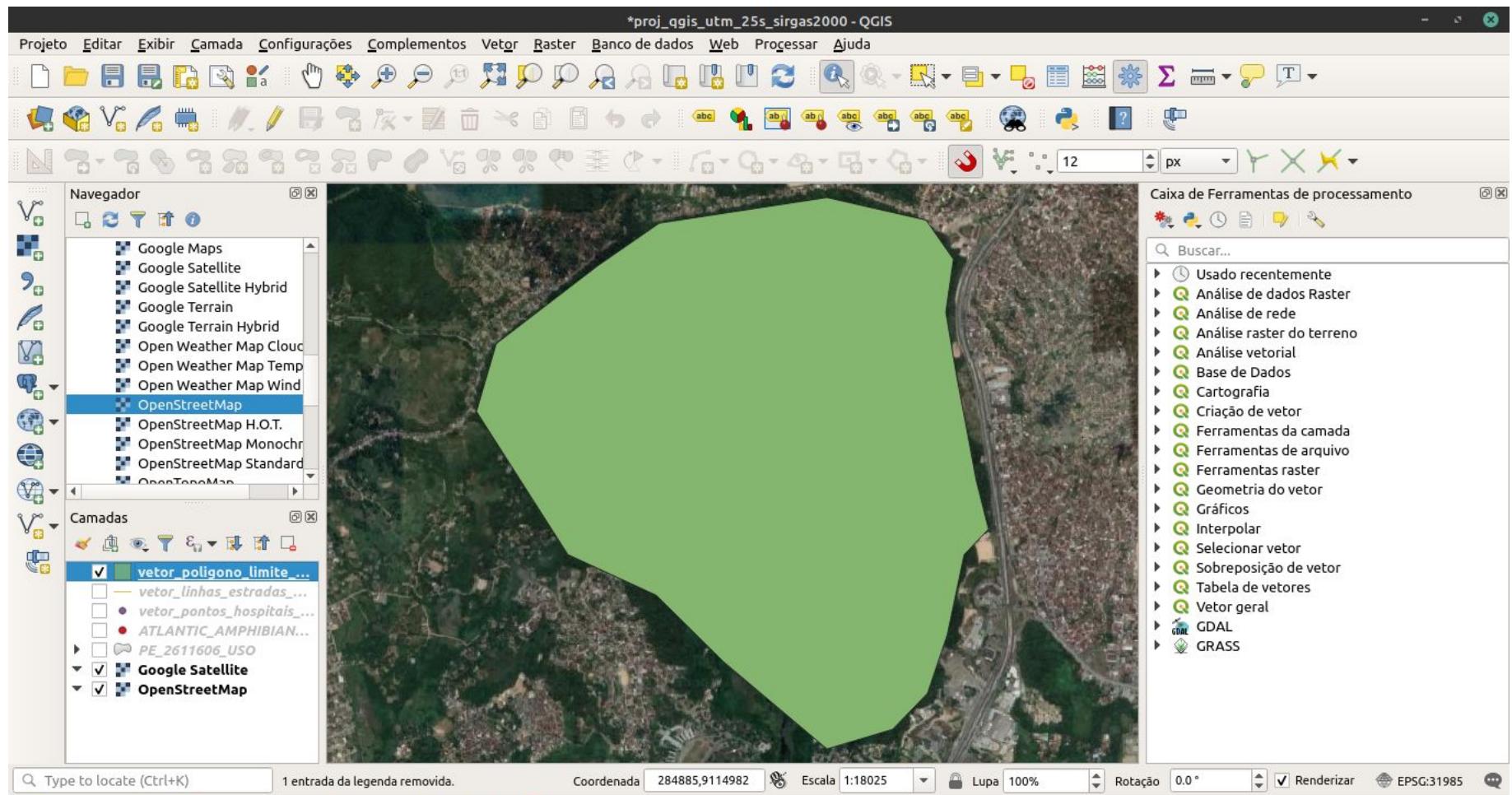
# 7.11 Edição de dados vetoriais

## Edição de polígonos



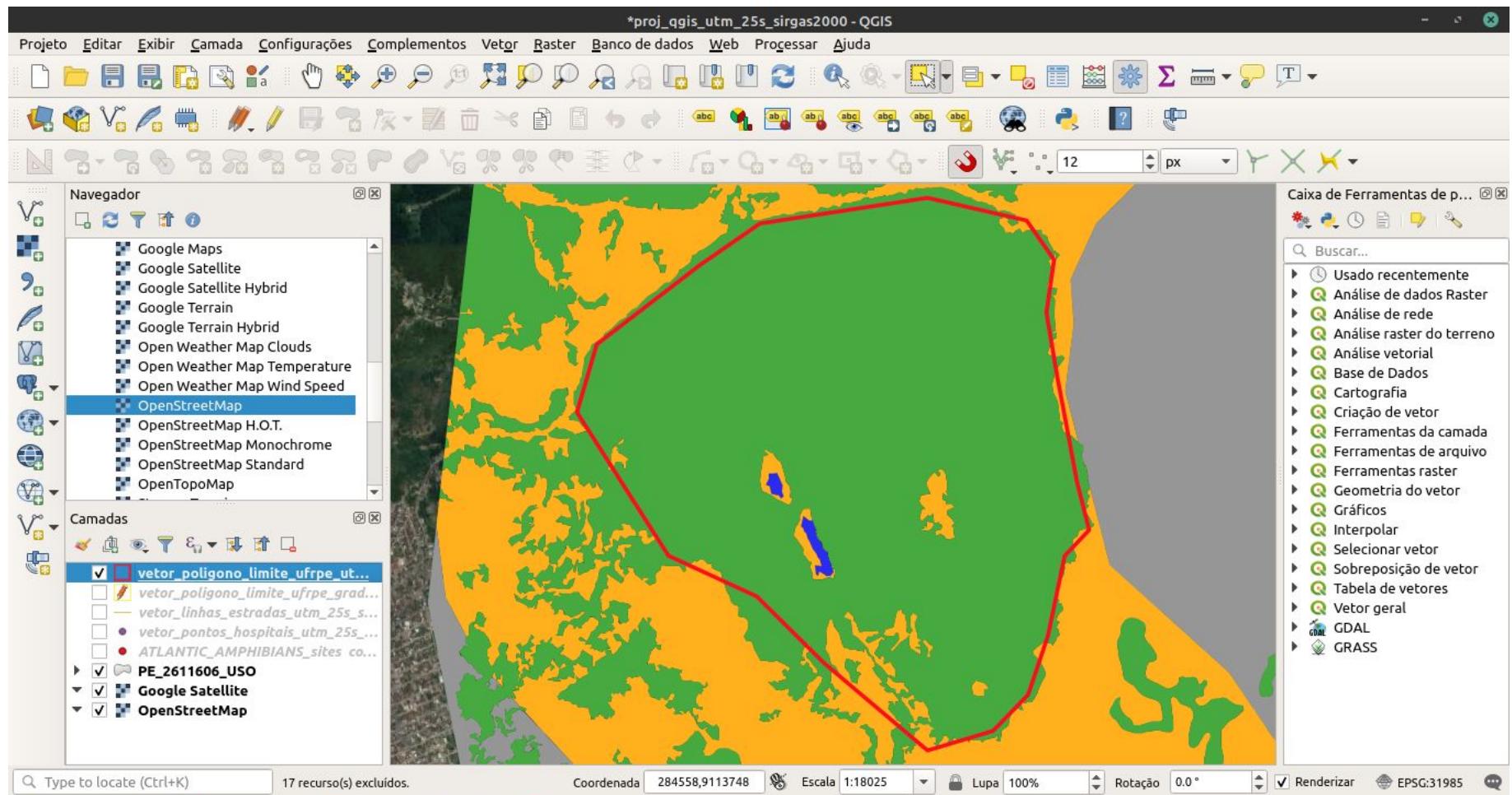
# 7.11 Edição de dados vetoriais

Esse é o limite da UFRPE???



# 7.12 Fotointerpretação de imagens

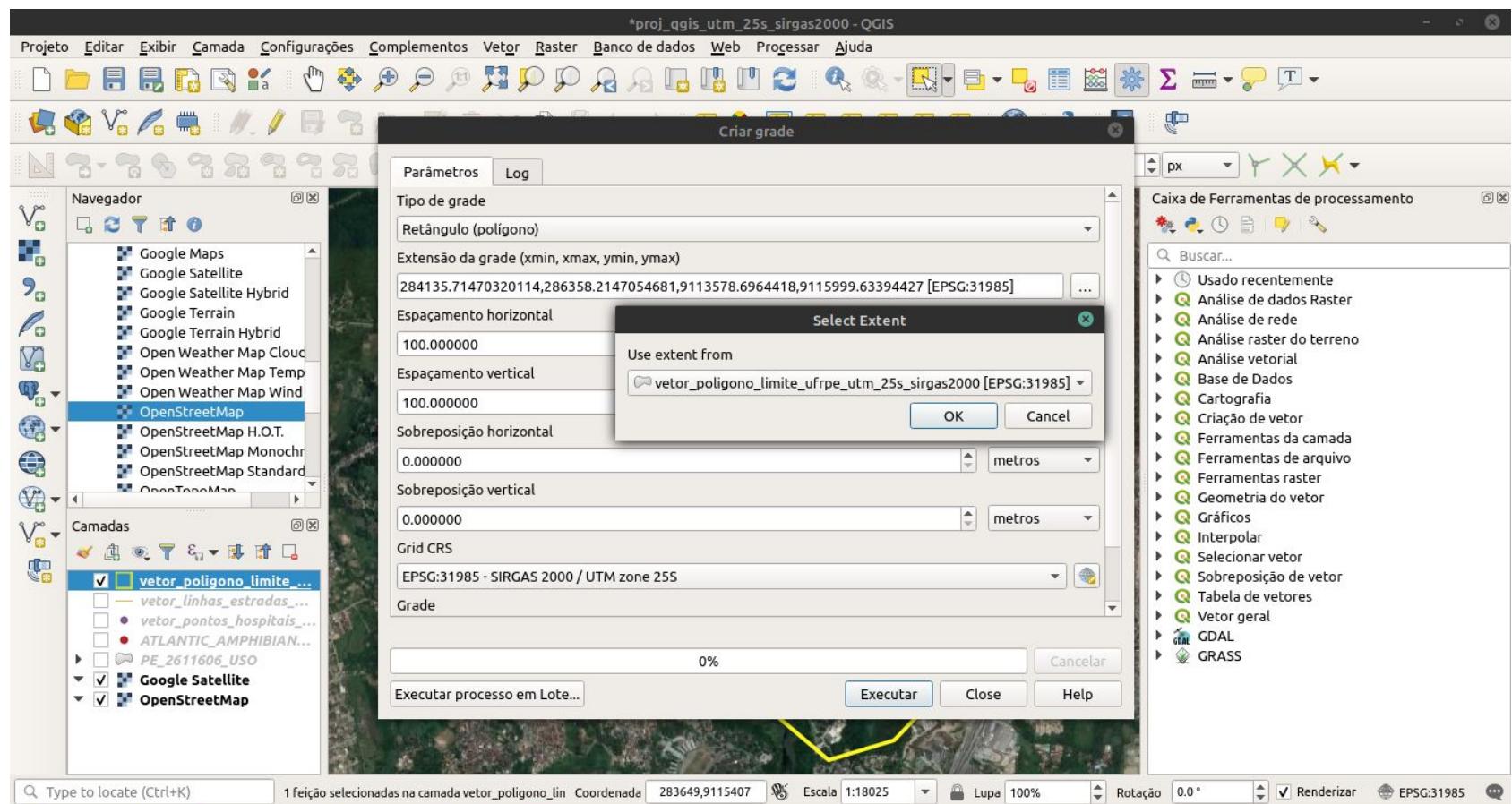
Vamos criar um mapa de uso da terra



# 7.12 Fotointerpretação de imagens

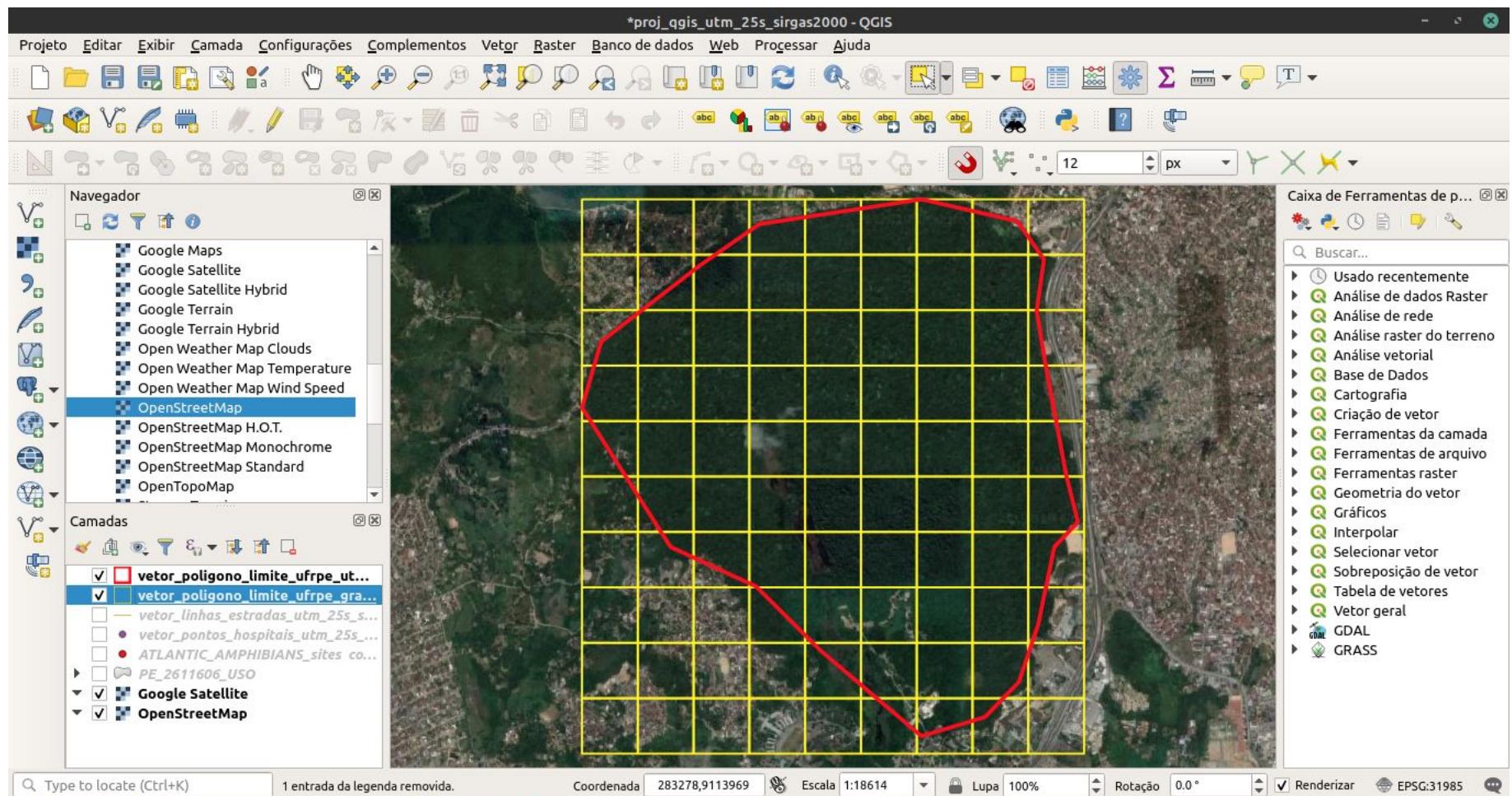
## Digitalização vetorial (segmentação e classificação)

Vetor > Investigar > Criar grade...



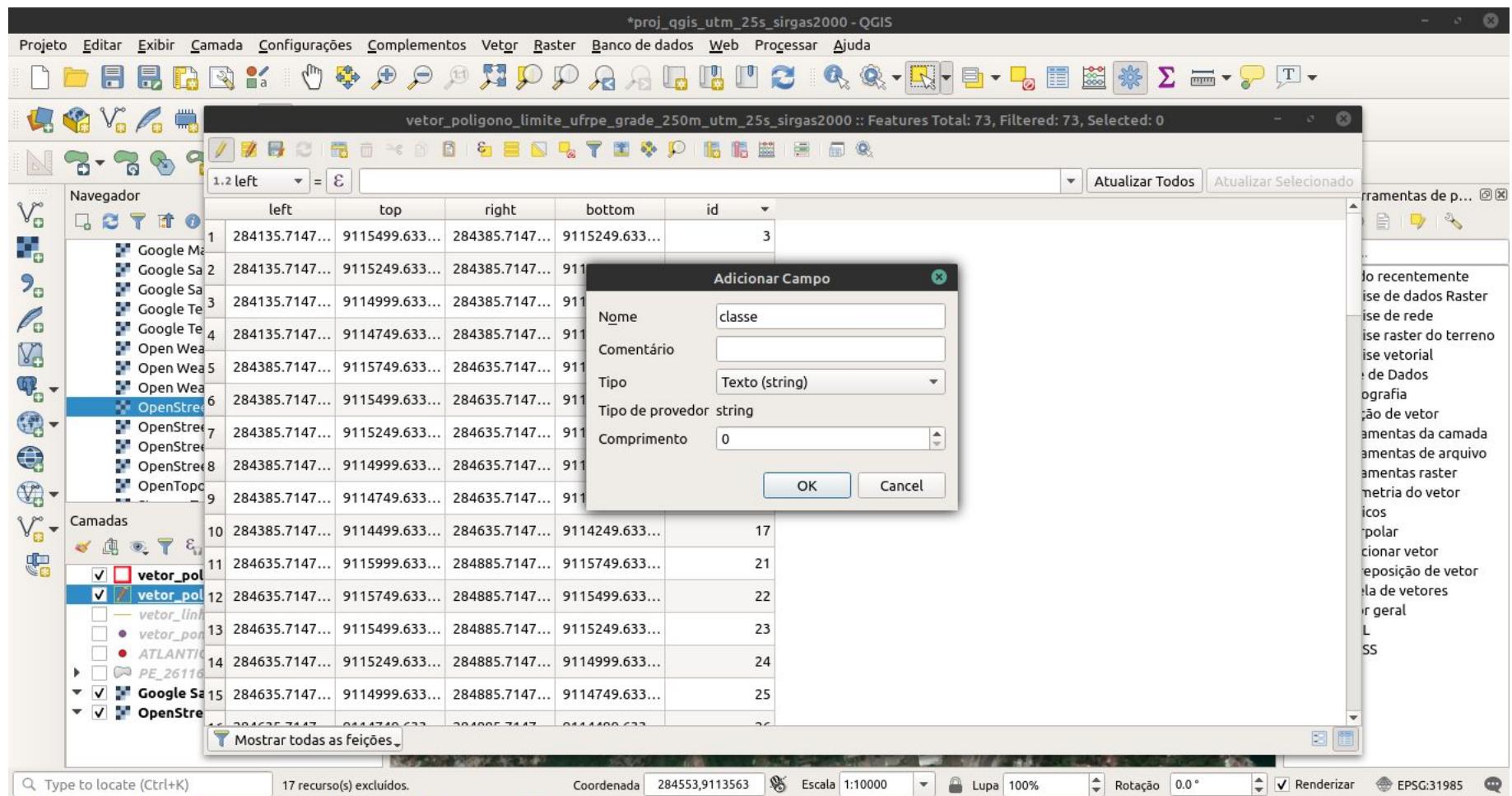
# 7.12 Fotointerpretação de imagens

## Grade de 250 m



# 7.12 Fotointerpretação de imagens

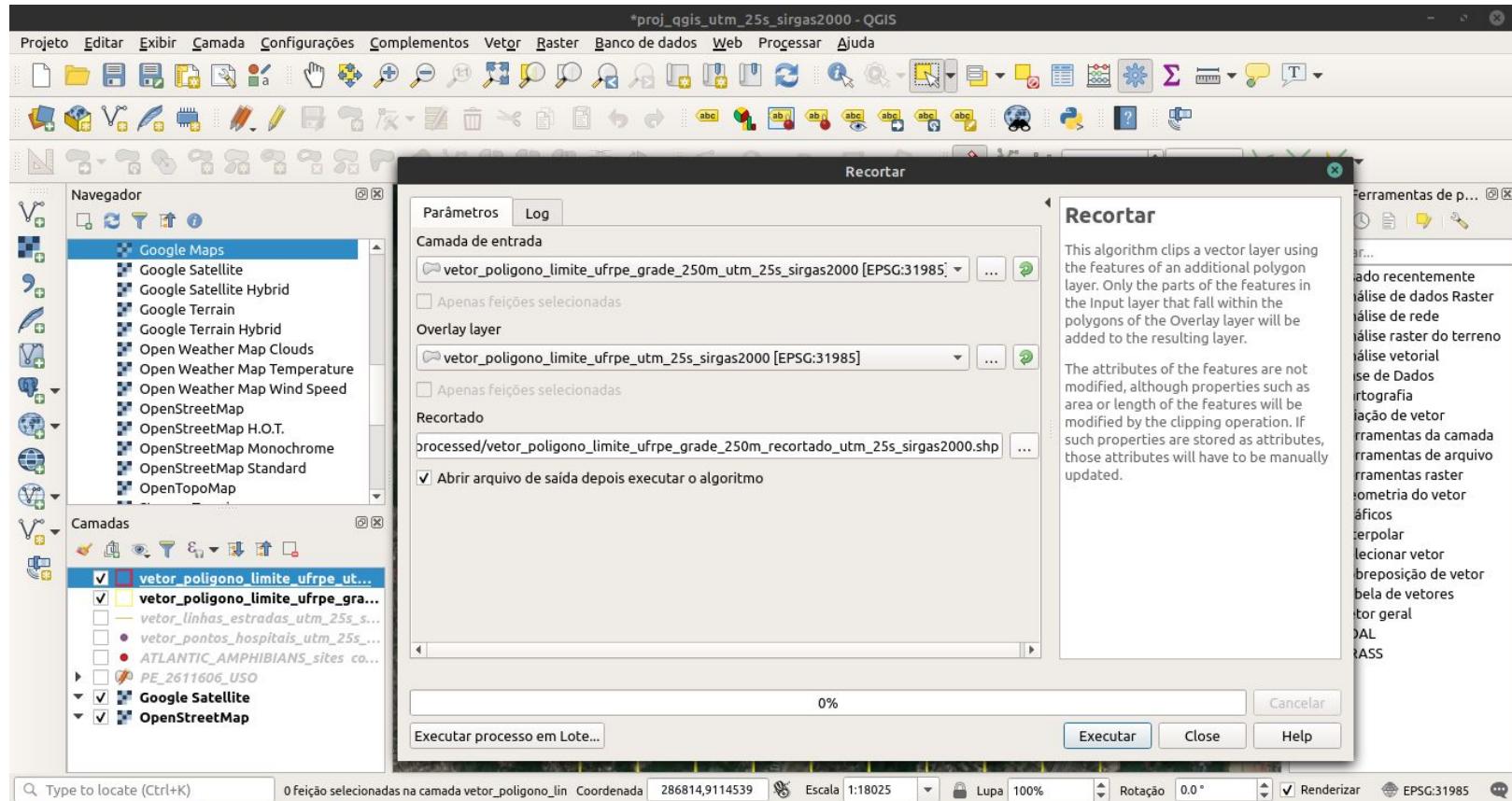
## Criar campo (coluna) para identificar a classe



# 7.12 Fotointerpretação de imagens

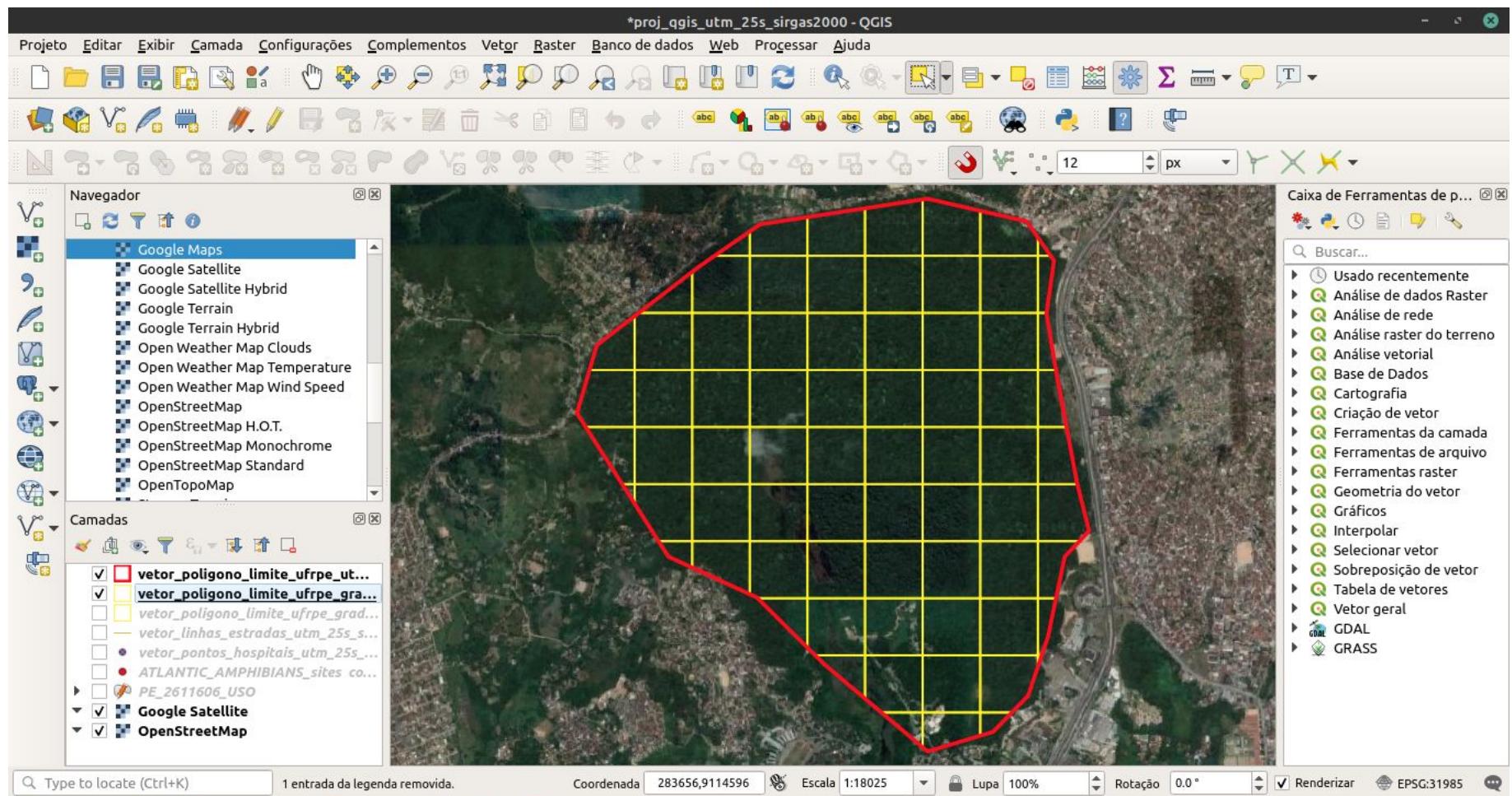
## Recortar apenas os grides dentro do limite

Vetor > Geoprocessamento > Recortar...



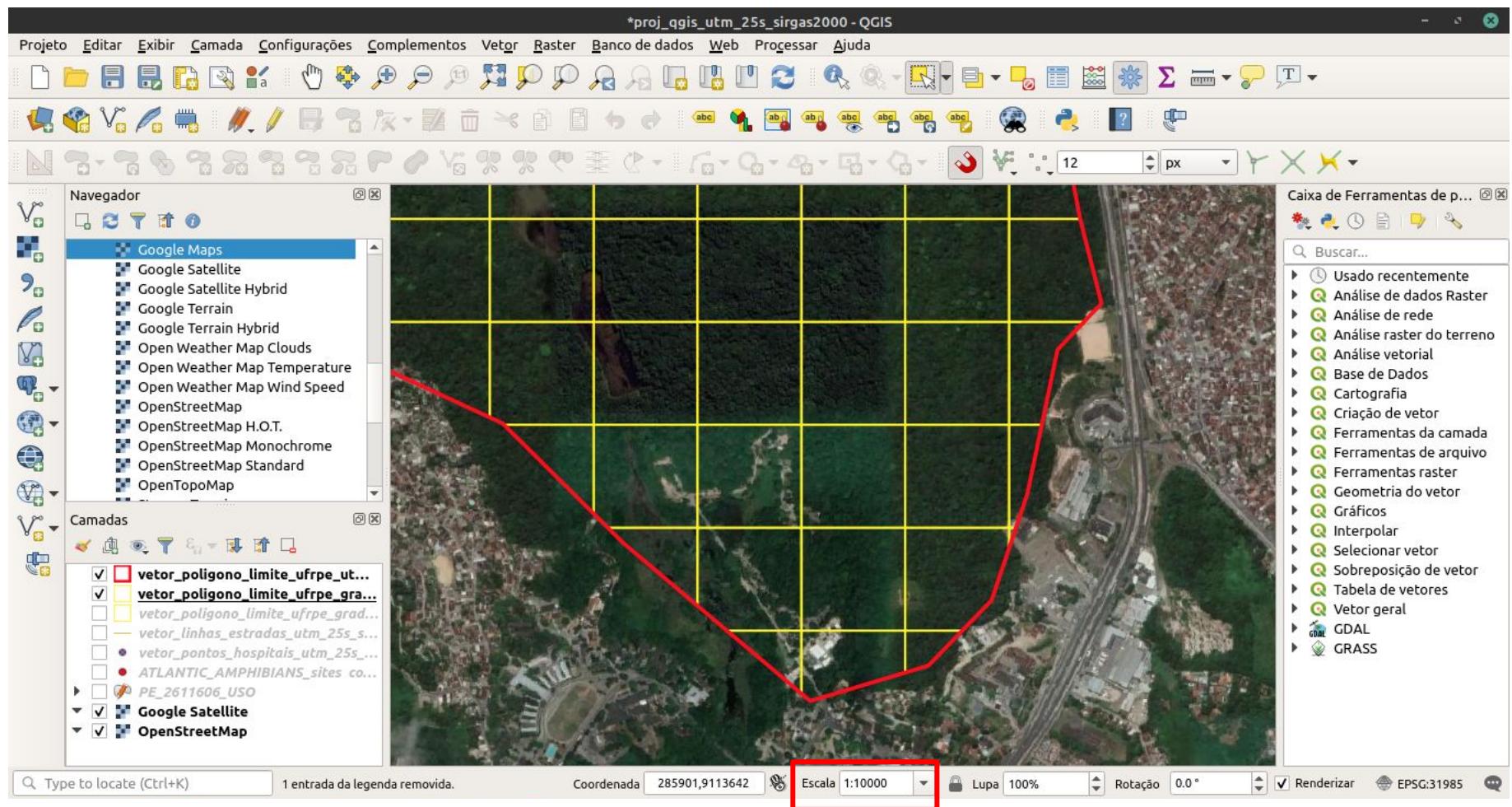
# 7.12 Fotointerpretação de imagens

Belo!



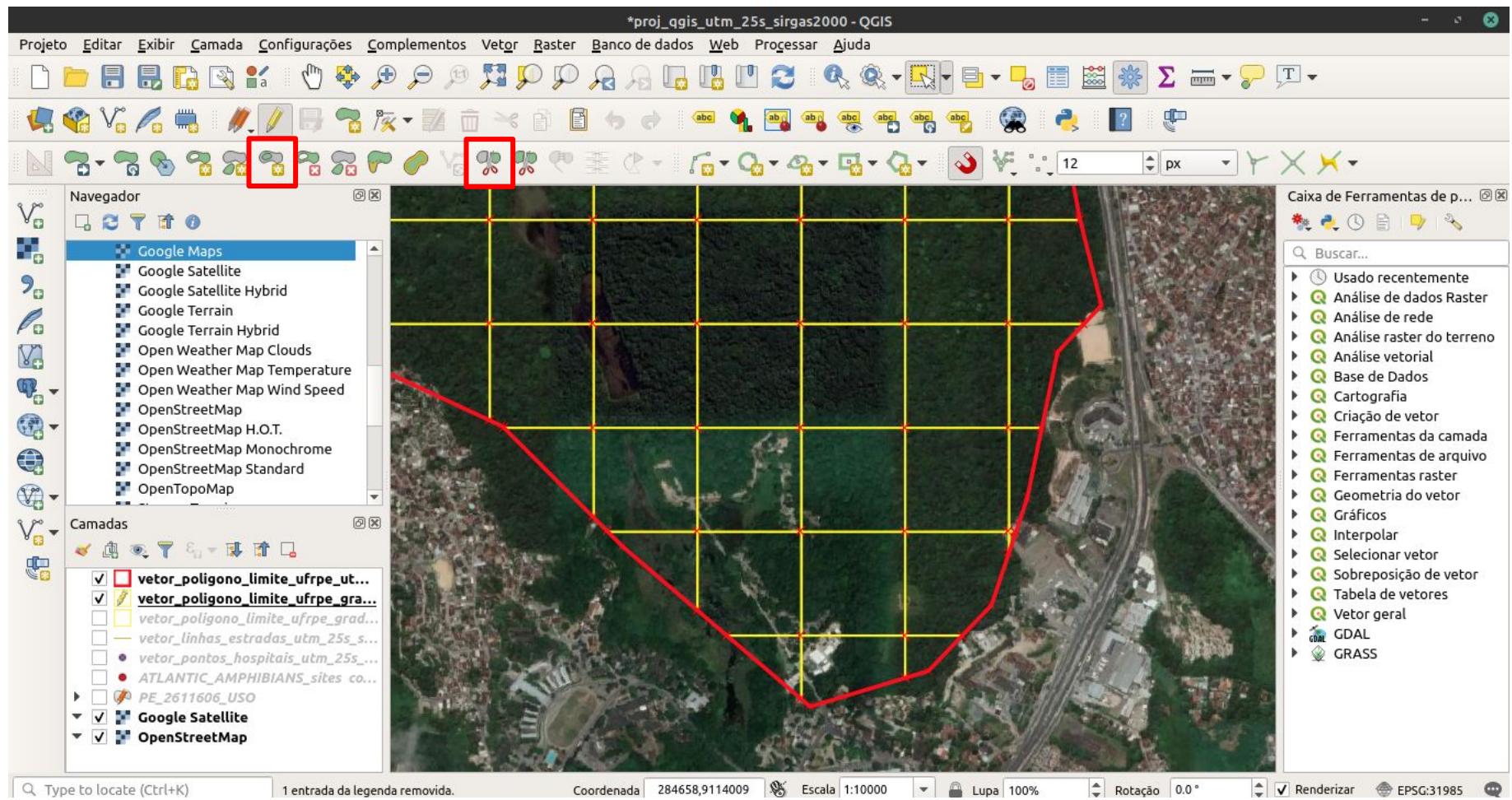
# 7.12 Fotointerpretação de imagens

## Zoom - Escala 1:10.000



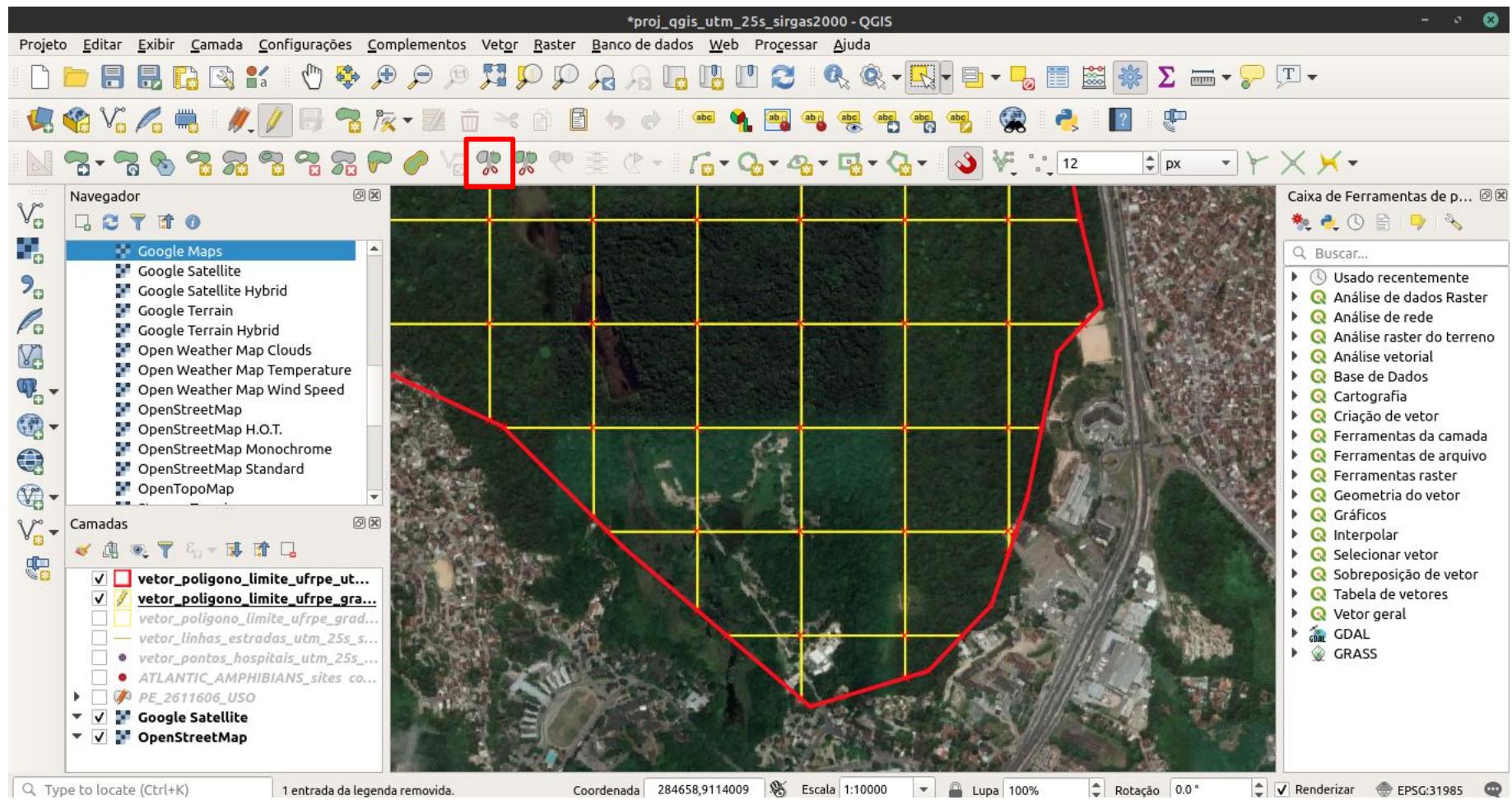
# 7.12 Fotointerpretação de imagens

## Ferramentas quebrar feições e preencher anel



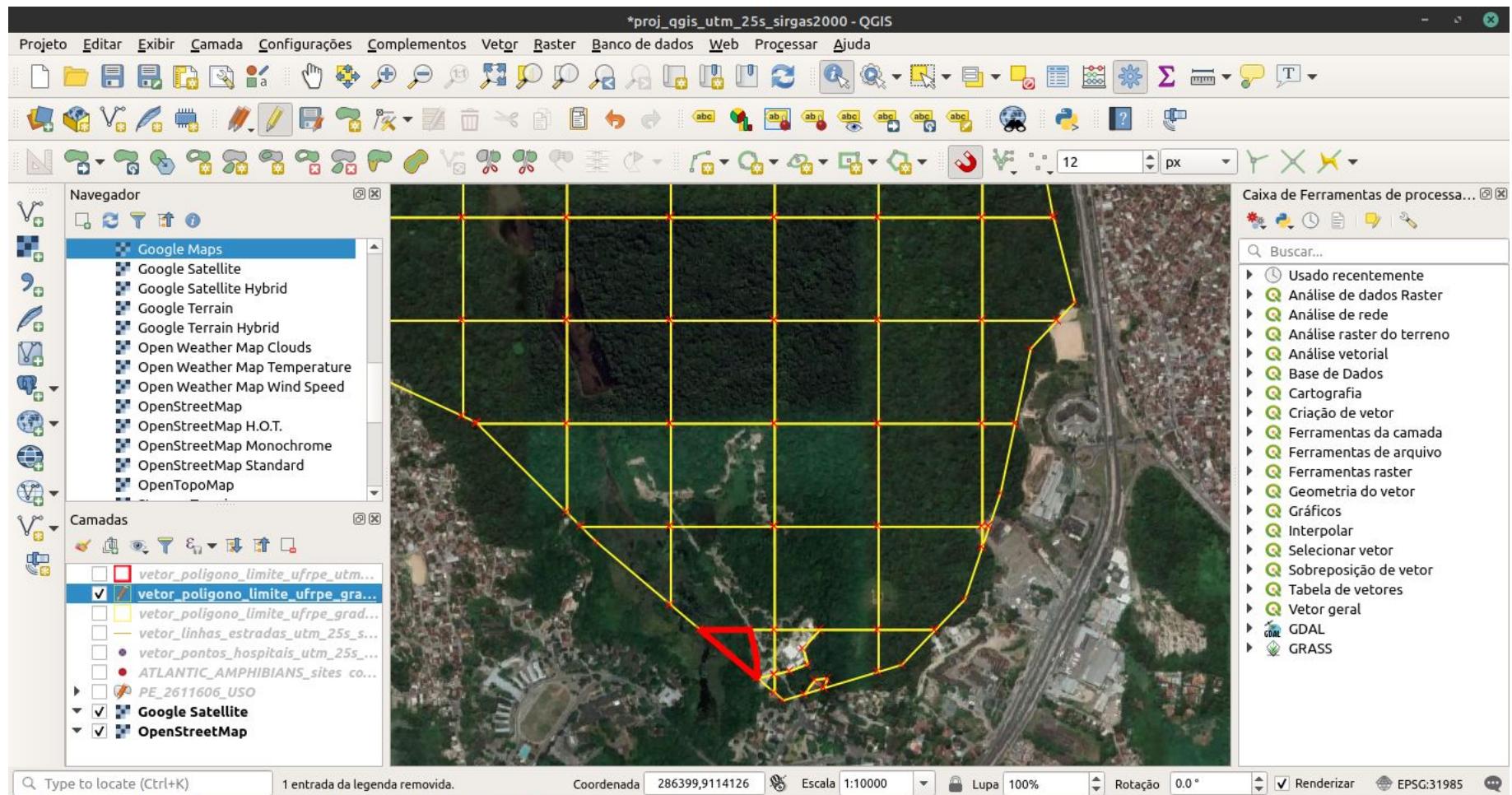
# 7.12 Fotointerpretação de imagens

## Ferramentas quebrar feições



# 7.12 Fotointerpretação de imagens

## Ferramentas quebrar feições



# 7.12 Fotointerpretação de imagens

## Tabela de atributos junto com visualização

\*proj\_qgis\_utm\_25s\_sirgas2000 - QGIS

Projeto Editar Exibir Camada Configurações Complementos Vídeo Raster Banco de dados Web Processar Ajuda

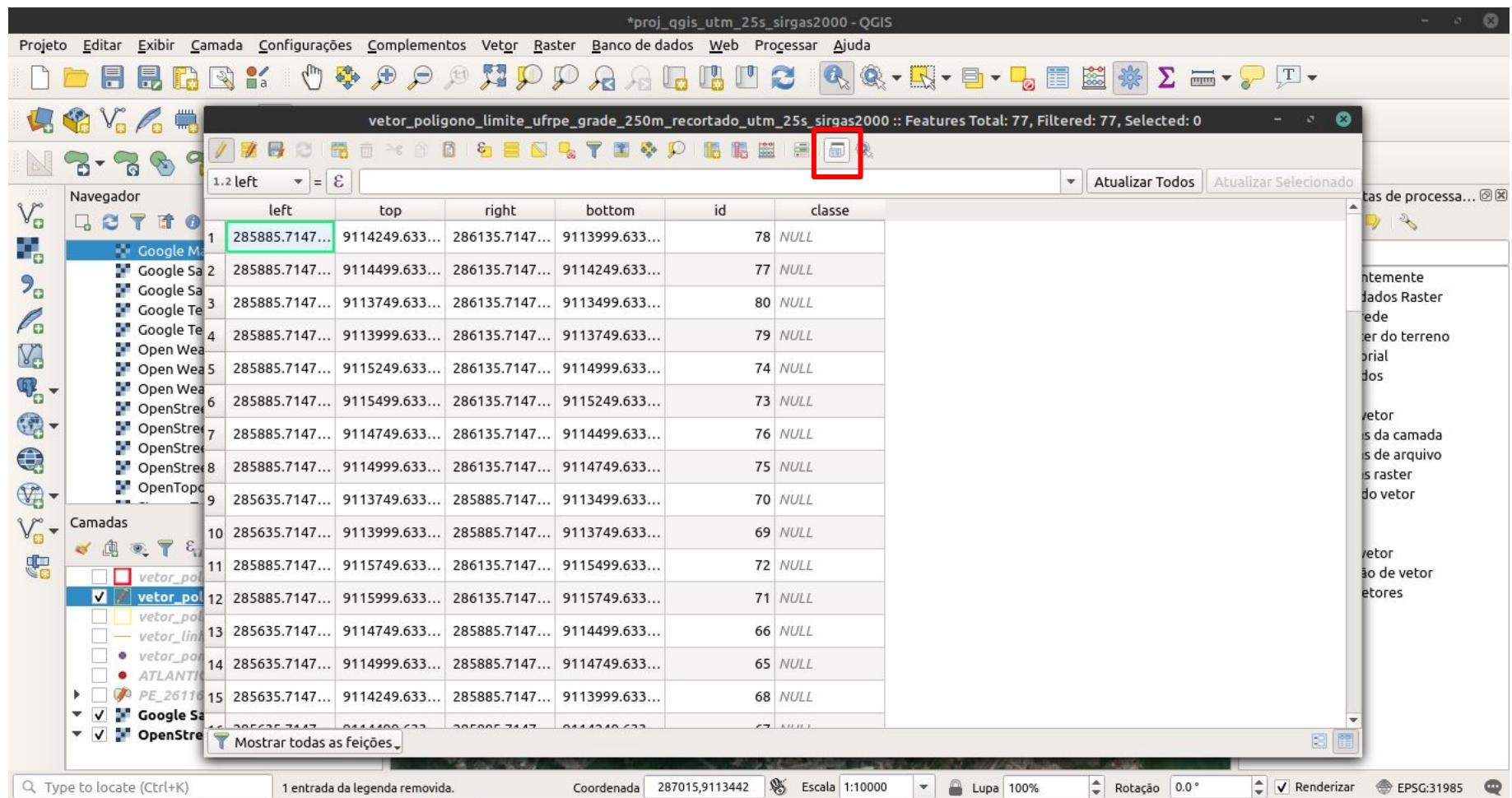
Navegador

	left	top	right	bottom	id	classe
1	285885.7147...	9114249.633...	286135.7147...	9113999.633...	78	NULL
2	285885.7147...	9114499.633...	286135.7147...	9114249.633...	77	NULL
3	285885.7147...	9113749.633...	286135.7147...	9113499.633...	80	NULL
4	285885.7147...	9113999.633...	286135.7147...	9113749.633...	79	NULL
5	285885.7147...	9115249.633...	286135.7147...	9114999.633...	74	NULL
6	285885.7147...	9115499.633...	286135.7147...	9115249.633...	73	NULL
7	285885.7147...	9114749.633...	286135.7147...	9114499.633...	76	NULL
8	285885.7147...	9114999.633...	286135.7147...	9114749.633...	75	NULL
9	285635.7147...	9113749.633...	285885.7147...	9113499.633...	70	NULL
10	285635.7147...	9113999.633...	285885.7147...	9113749.633...	69	NULL
11	285885.7147...	9115749.633...	286135.7147...	9115499.633...	72	NULL
12	285885.7147...	9115999.633...	286135.7147...	9115749.633...	71	NULL
13	285635.7147...	9114749.633...	285885.7147...	9114499.633...	66	NULL
14	285635.7147...	9114999.633...	285885.7147...	9114749.633...	65	NULL
15	285635.7147...	9114249.633...	285885.7147...	9113999.633...	68	NULL
16	285635.7147...	9114499.633...	285885.7147...	9114249.633...	67	NULL

Mostrar todas as feições

Camadas

Type to locate (Ctrl+K) 1 entrada da legenda removida. Coordenada 287015,9113442 Escala 1:10000 Lupa 100% Rotação 0.0° Renderizar EPSG:31985



# 7.12 Fotointerpretação de imagens

## Tabela de atributos junto com visualização

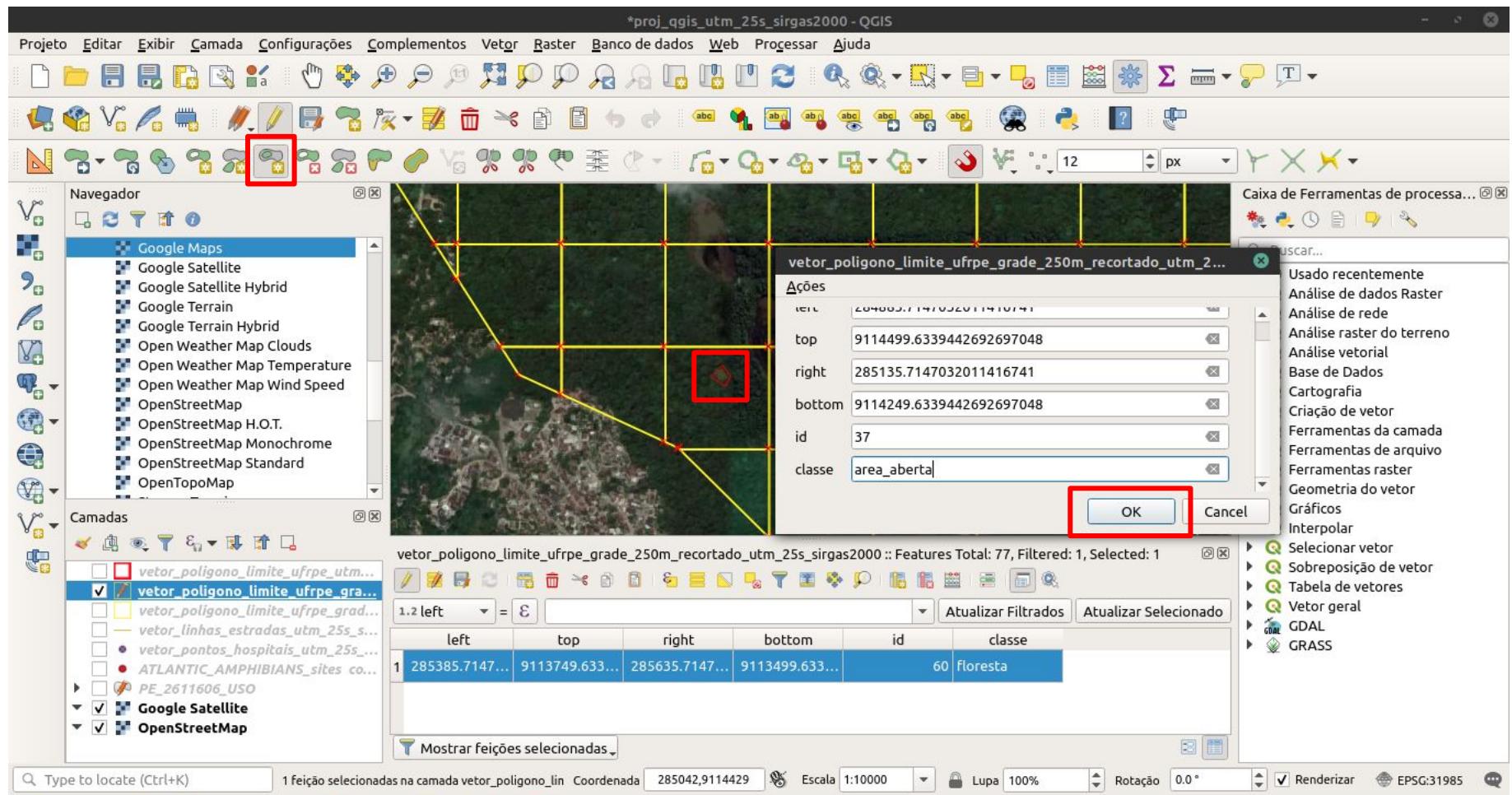
The screenshot shows the QGIS interface with the following details:

- Toolbar:** Standard QGIS toolbar with various tools for selection, measurement, and analysis.
- Google Maps Layer:** A layer from Google Maps is selected in the Navegador (Navigator) panel.
- Layers Panel:** The Camadas (Layers) panel shows several layers:
  - vetor\_poligono\_limite\_ufrpe\_grade\_250m\_recortado\_utm\_25s\_sirgas2000**: Selected layer, highlighted with a red border.
  - vetor\_poligono\_limite\_ufrpe\_gra...**: Another vector layer.
  - vetor\_linhas\_estradas\_utm\_25s\_s...**: A line layer.
  - vetorPontos\_hospitais\_utm\_25s...**: A point layer.
  - ATLANTIC\_AMPHIBIANS\_sites co...**: A layer with a specific symbol.
  - PE\_2611606\_USO**: A layer with a specific symbol.
  - Google Satellite**: A satellite imagery layer.
  - OpenStreetMap**: An OpenStreetMap layer.
- Map View:** A satellite view of a green area with a yellow polygon selection overlaid. A yellow triangle highlights a specific point within the polygon.
- Attribute Table:** The table shows the spatial coordinates and class information for the selected feature.

	left	top	right	bottom	id	classe
1	285385.7147...	9113749.633...	285635.7147...	9113499.633...	60	floresta
- Processing Toolbox:** Shows a list of recent and available processing algorithms.
- Status Bar:** Displays the coordinates (285852, 9113858), scale (1:10000), and rotation (0.0°).

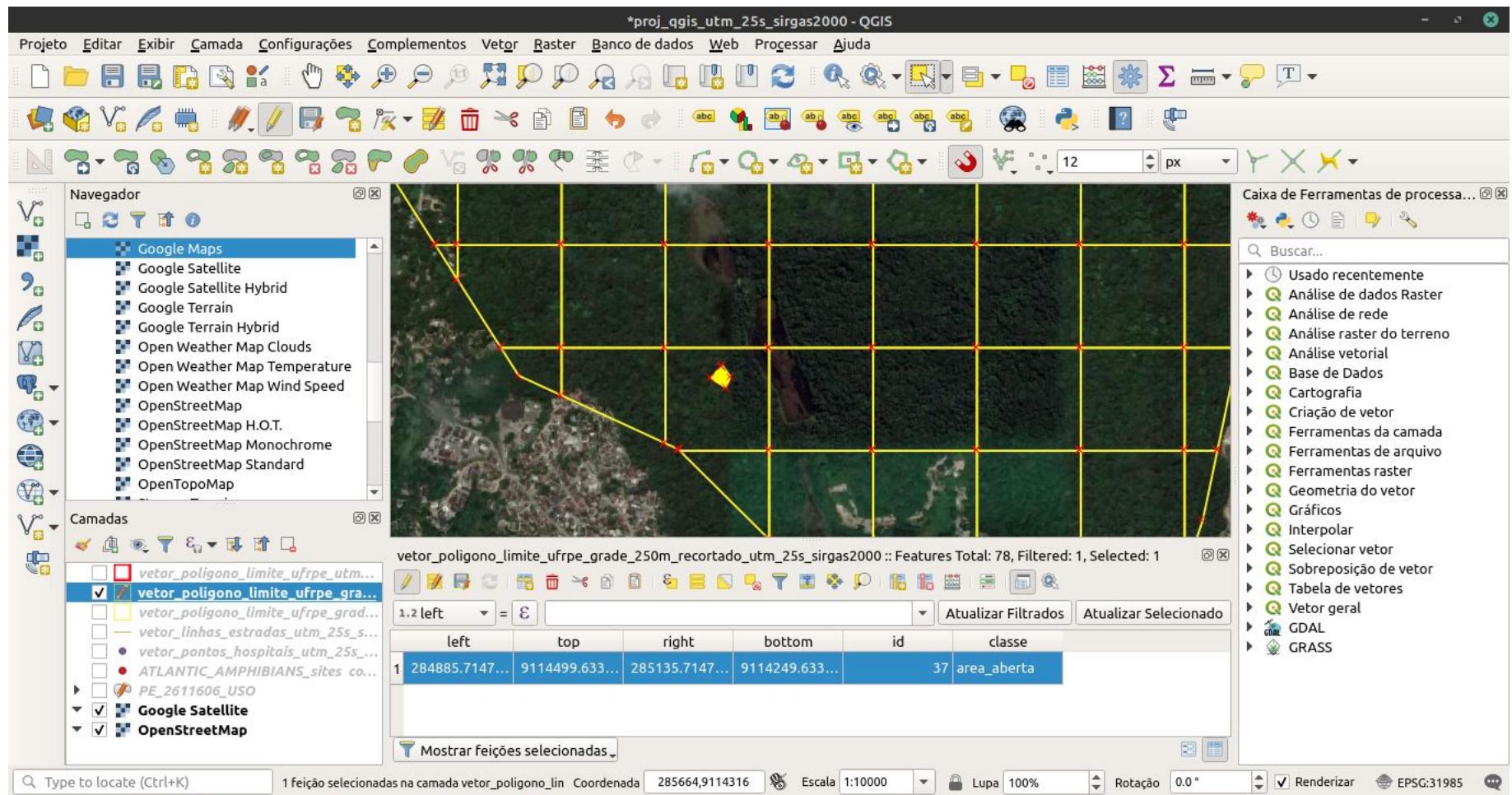
# 7.12 Fotointerpretação de imagens

## Ferramenta preencher anel



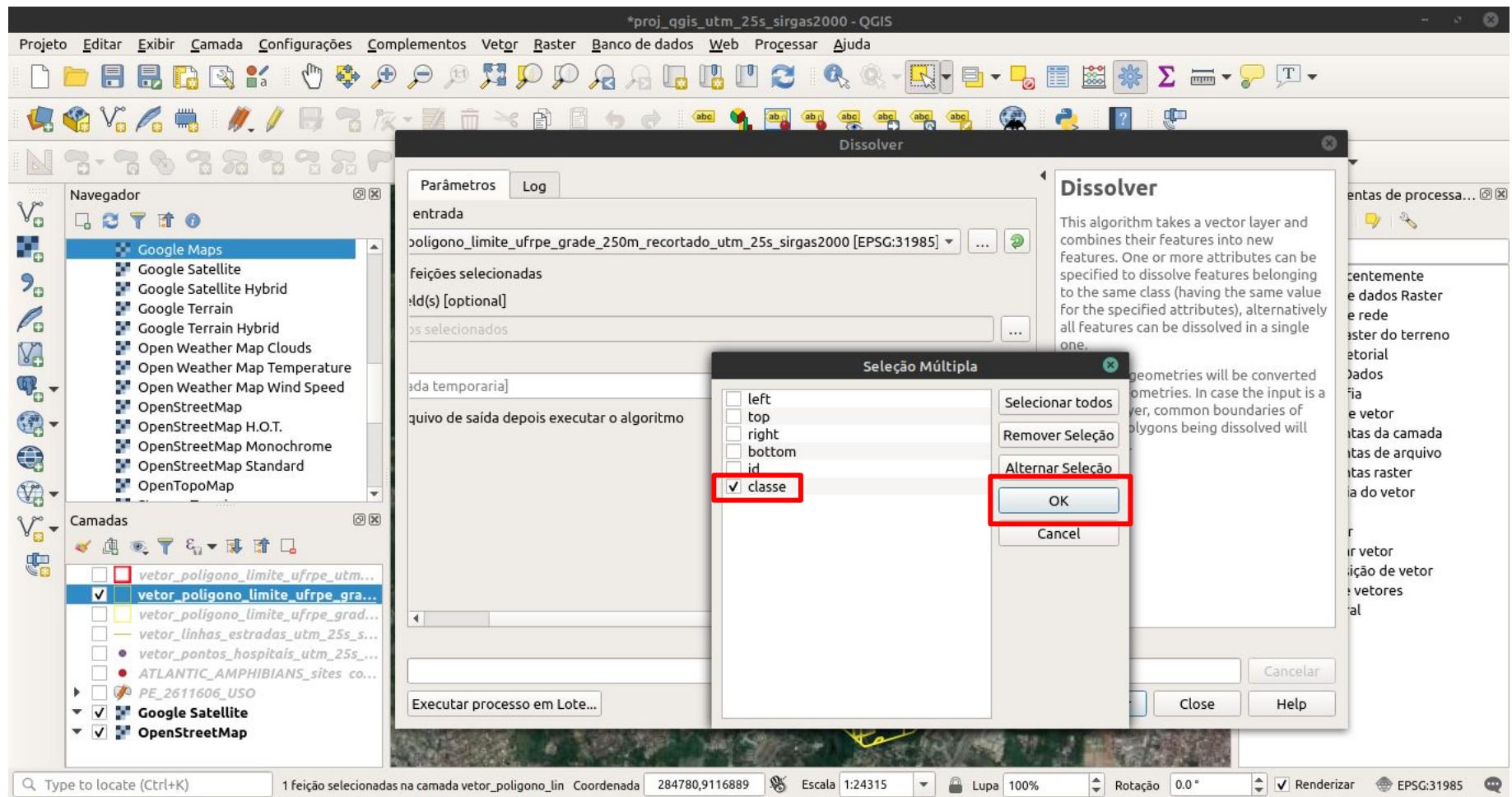
# 7.12 Fotointerpretação de imagens

## Ferramenta preencher anel



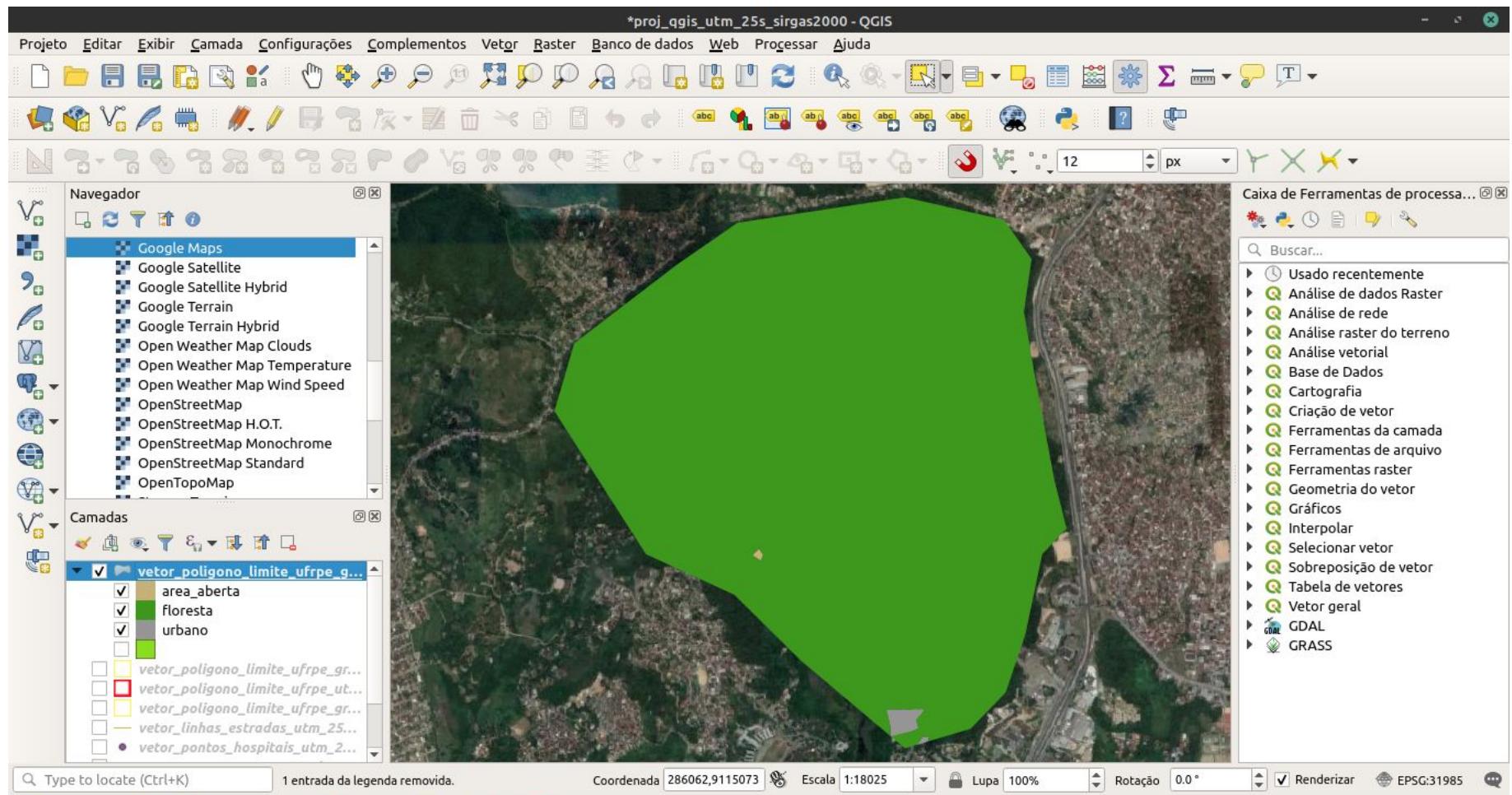
# 7.12 Fotointerpretação de imagens

## Ferramenta dissolver



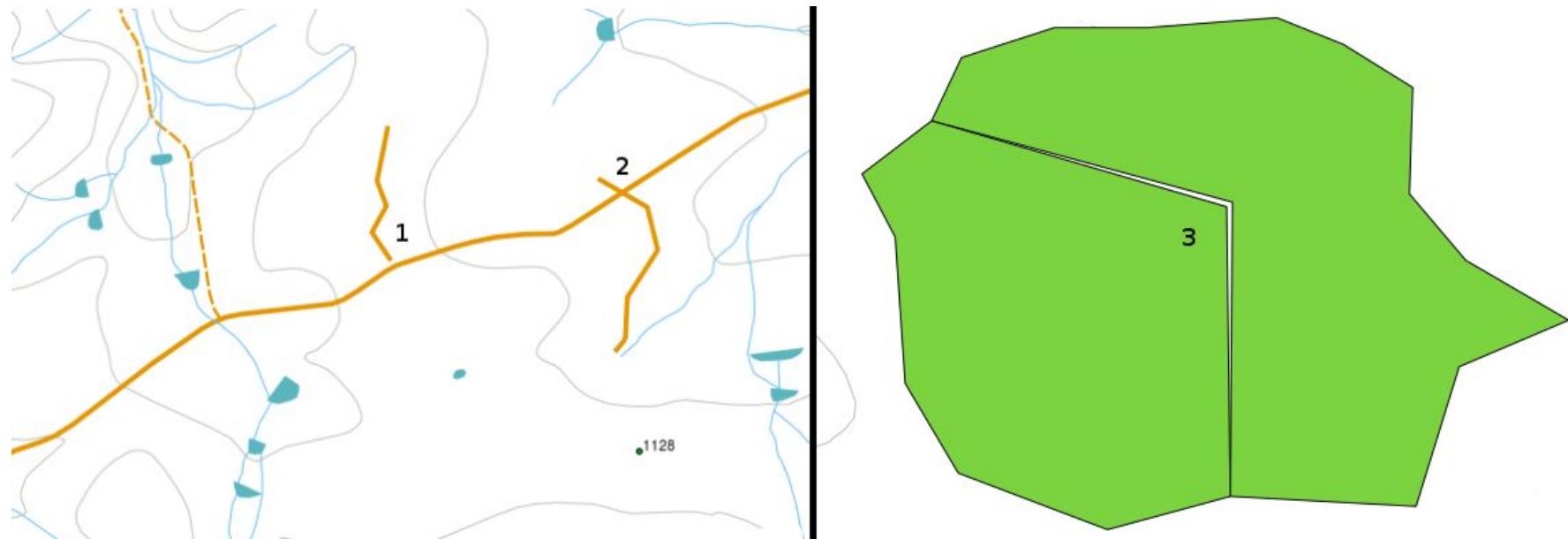
# 7.12 Fotointerpretação de imagens

## Ferramenta dissolver



# 7.13 Verificação geométrica e ajuste topológico

## Erros de topologia



# 7.13 Verificação geométrica e ajuste topológico

## Plugin - Verificador de topologia



Screenshot of QGIS 3.16.1 showing the 'Verificador de topologia' (Topology Checker) plugin interface.

The toolbar has a red box around the topology checker icon (a blue polygon with yellow nodes).

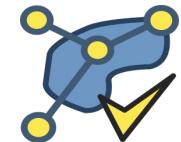
The 'Complementos' (Plugins) panel shows the 'Verificador de topologia' plugin is installed (checked). A tooltip says: "This is a core plugin, so you can't uninstall it".

The 'Camadas' (Layers) panel shows vector layers: 'vetor\_poligono\_limite\_ufrpe' (selected) containing 'area\_aberta', 'floresta', and 'urbano'; and other layers like 'vetor\_poligono\_limite\_ufrpe\_1' through 'vetor\_pontos\_hospitais\_utm\_2'.

The status bar at the bottom includes: 'Type to locate (Ctrl+K)', '1 entrada da legenda removida.', 'Coordenada 284083,9115998', 'Escala 1:18025', 'Lupa 100%', 'Rotação 0.0°', 'Renderizar', and 'EPSG:31985'.

# 7.13 Verificação geométrica e ajuste topológico

## Plugin - Verificador de topologia



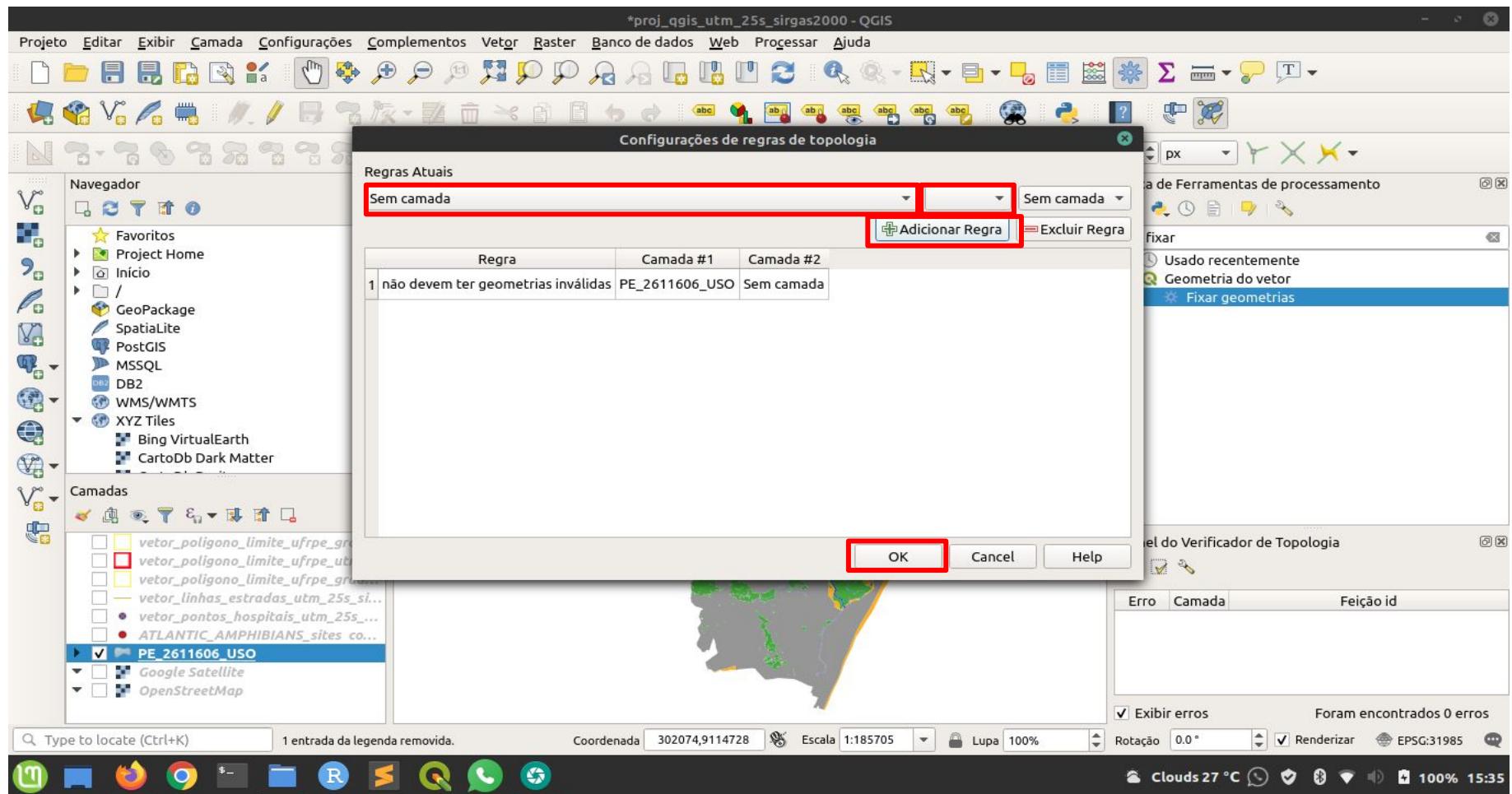
The screenshot shows the QGIS application interface with the following components visible:

- Toolbar:** Standard QGIS tools for selection, measurement, and editing.
- Layer Panel:** Shows the "Navegador" (Favorites) and "Camadas" (Layers). The "PE\_2611606\_USO" layer is selected and highlighted in blue.
- Map View:** Displays a map of a coastal area with various land use categories represented by different colors (green, orange, grey).
- Processing Toolbox:** Shows the "Caixa de Ferramentas de processamento" (Processing Toolbox) with the "Fixar" (Fix) tool expanded, specifically the "Geometria do vetor" (Vector Geometry) section.
- Topology Checker Panel:** The "Painel do Verificador de Topologia" (Topology Checker Panel) is open, showing a table with columns "Erro" (Error), "Camada" (Layer), and "Feição id" (Feature ID). It includes a checkbox for "Exibir erros" (Show errors) and a message stating "Foram encontrados 0 erros" (0 errors found).
- Status Bar:** At the bottom, it shows coordinates (297799, 9105883), scale (1:185705), and rotation (0.0°).

A red box highlights the "Fixar geometrias" (Fix geometries) button in the Processing Toolbox panel, and another red box highlights the "Fix" button in the Topology Checker panel.

# 7.13 Verificação geométrica e ajuste topológico

## Topologia



# 7.13 Verificação geométrica e ajuste topológico

## Topologia

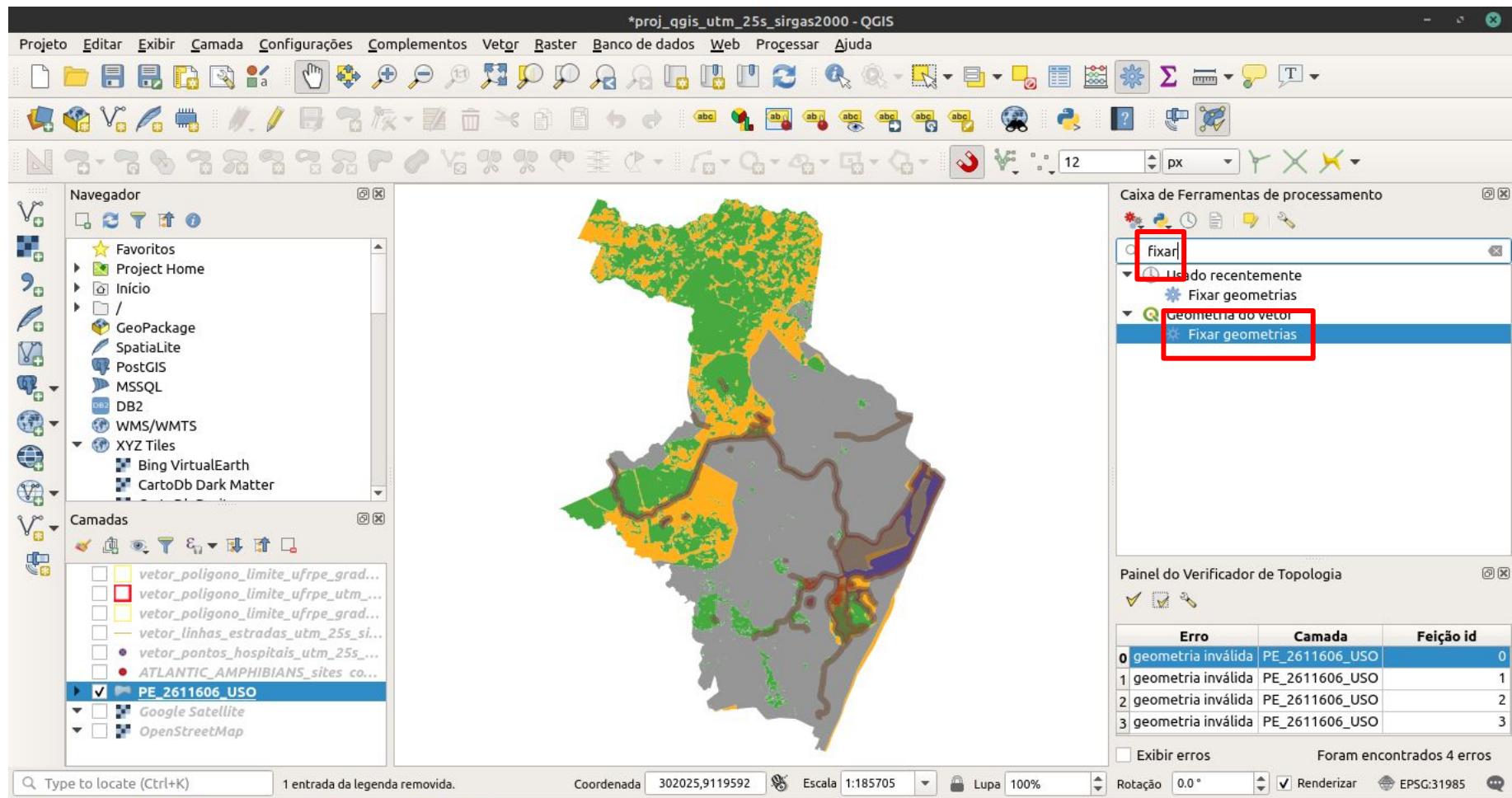
The screenshot shows the QGIS interface with the title bar "proj\_qgis\_utm\_25s\_sirgas2000 - QGIS". The menu bar includes Projeto, Editar, Exibir, Camada, Configurações, Complementos, Vetor, Raster, Banco de dados, Web, Processar, and Ajuda. The toolbar contains various editing and selection tools. The Navegador panel on the left lists Favorites, Project Home, Início, /, GeoPackage, Spatialite, PostGIS, MSSQL, DB2, WMS/WMTS, and XYZ Tiles (Bing VirtualEarth, CartoDb Dark Matter). The Camadas panel shows several vector layers, with "PE\_2611606\_USO" selected and highlighted in blue. The main map view displays a complex polygonal area with various colors (green, orange, grey) representing different land use or administrative units. The Caixa de Ferramentas de processamento panel on the right has a section titled "Fixar" containing "Usado recentemente" and "Geometria do vetor", with "Fixar geometrias" selected. The Painel de Verificador de Topologia panel at the bottom right shows a table of errors:

Erro	Camada	Feição id
0 geometria inválida	PE_2611606_USO	0
1 geometria inválida	PE_2611606_USO	1
2 geometria inválida	PE_2611606_USO	2
3 geometria inválida	PE_2611606_USO	3

Below the table, there are checkboxes for "Exibir erros" and "Renderizar", and a status bar at the bottom with coordinates, scale, and rotation information.

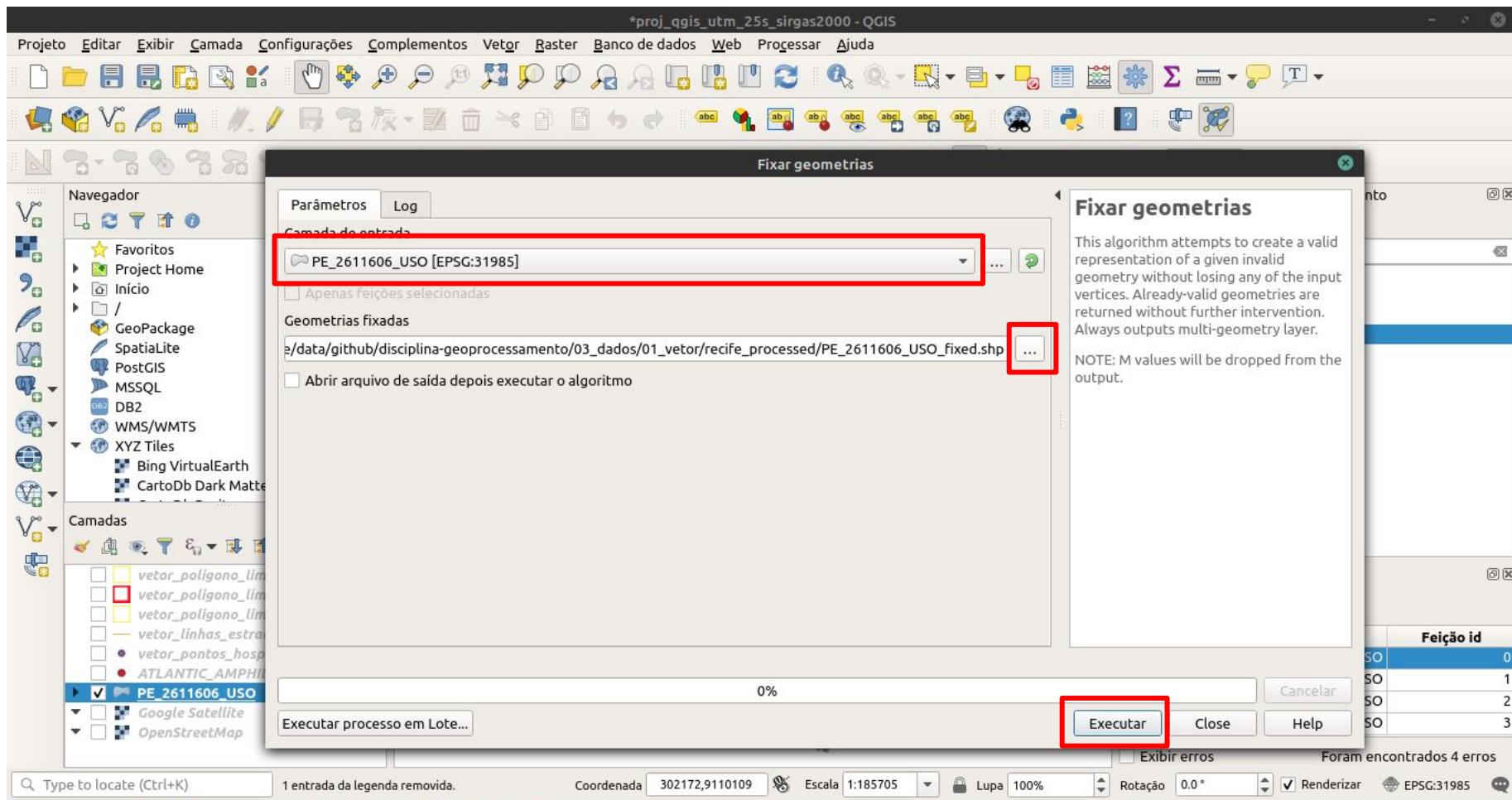
# 7.13 Verificação geométrica e ajuste topológico

## Fixar geometrias



# 7.13 Verificação geométrica e ajuste topológico

## Fixar geometrias



# 7.13 Verificação geométrica e ajuste topológico

## Topologia

Screenshot of QGIS showing the topology verification process.

The main window title is `*proj_qgis_utm_25s_sirgas2000 - QGIS`. The toolbar and layers panel are visible on the left.

A dialog box titled "Configurações de regras de topologia" (Topology Rule Configurations) is open. It shows a table with one rule:

Regra	Camada #1	Camada #2
1 não devem ter geometrias inválidas	PE_2611606_USO_fixed	Sem camada

The "OK" button at the bottom right of the dialog is highlighted with a red box.

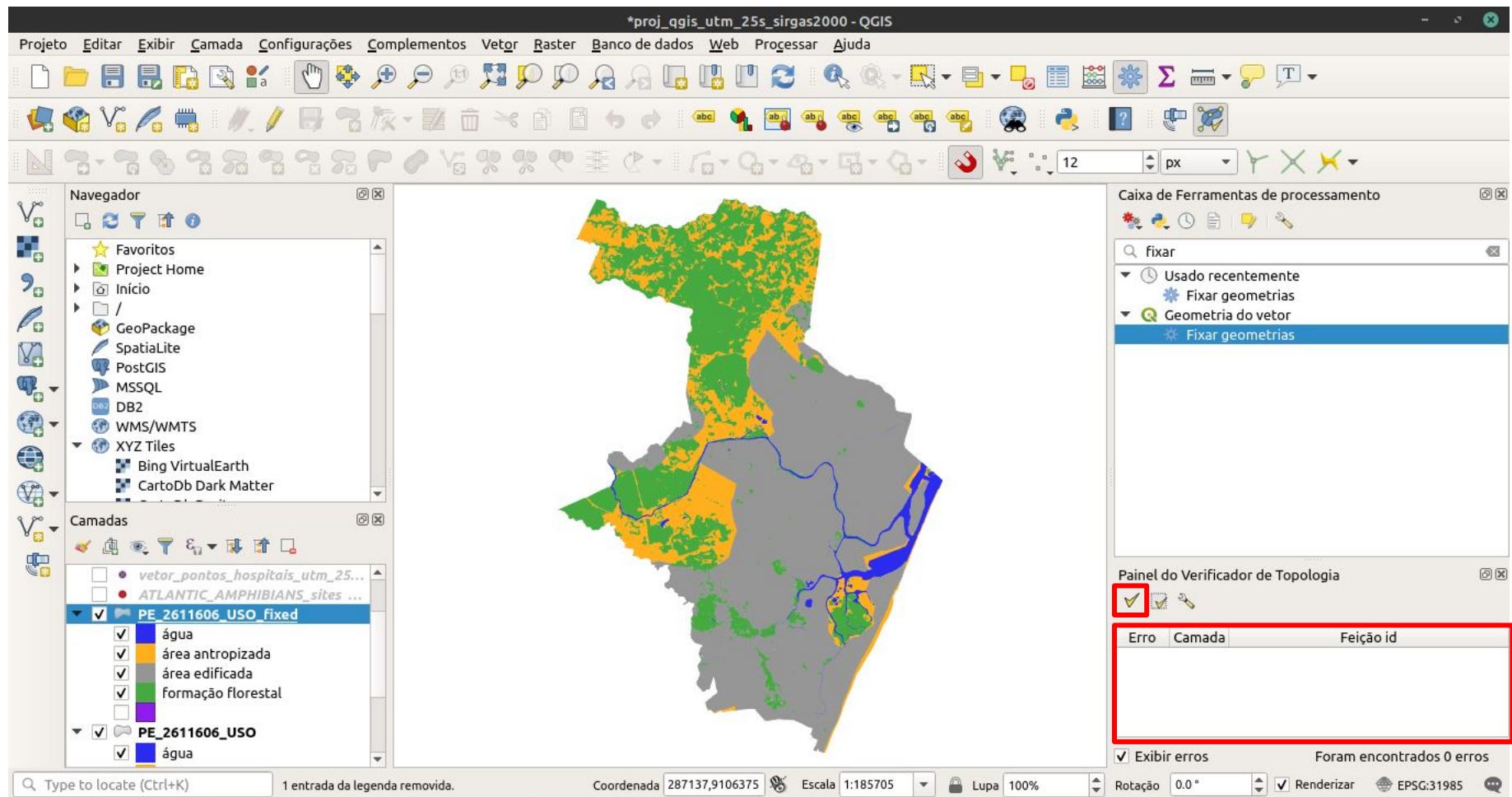
In the bottom right corner, there is a "Verificador de Topologia" (Topology Checker) panel showing the following errors:

Erro	Camada	Feição id
0 geometria inválida	PE_2611606_USO	0
1 geometria inválida	PE_2611606_USO	1
2 geometria inválida	PE_2611606_USO	2
3 geometria inválida	PE_2611606_USO	3

The panel also includes buttons for "Exibir erros" (Show errors) and "Foram encontrados 4 erros" (4 errors found).

# 7.13 Verificação geométrica e ajuste topológico

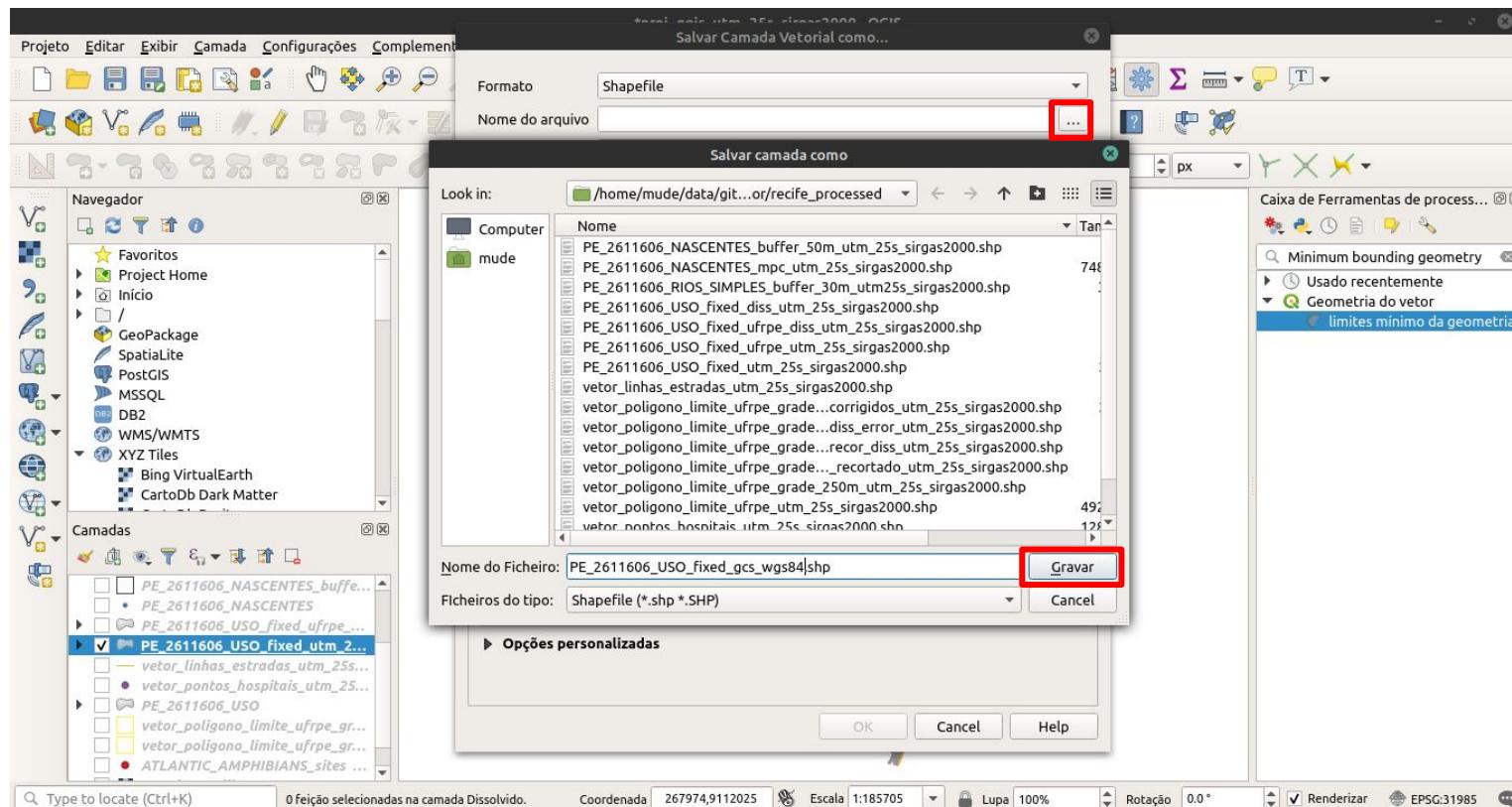
## Topologia



# 7.14 Reprojetar e exportar dados vetoriais

Exportar PE\_2611606\_USO\_fixed\_utm\_25s\_sirgas2000 com coordenadas geográficas e Datum WGS 84

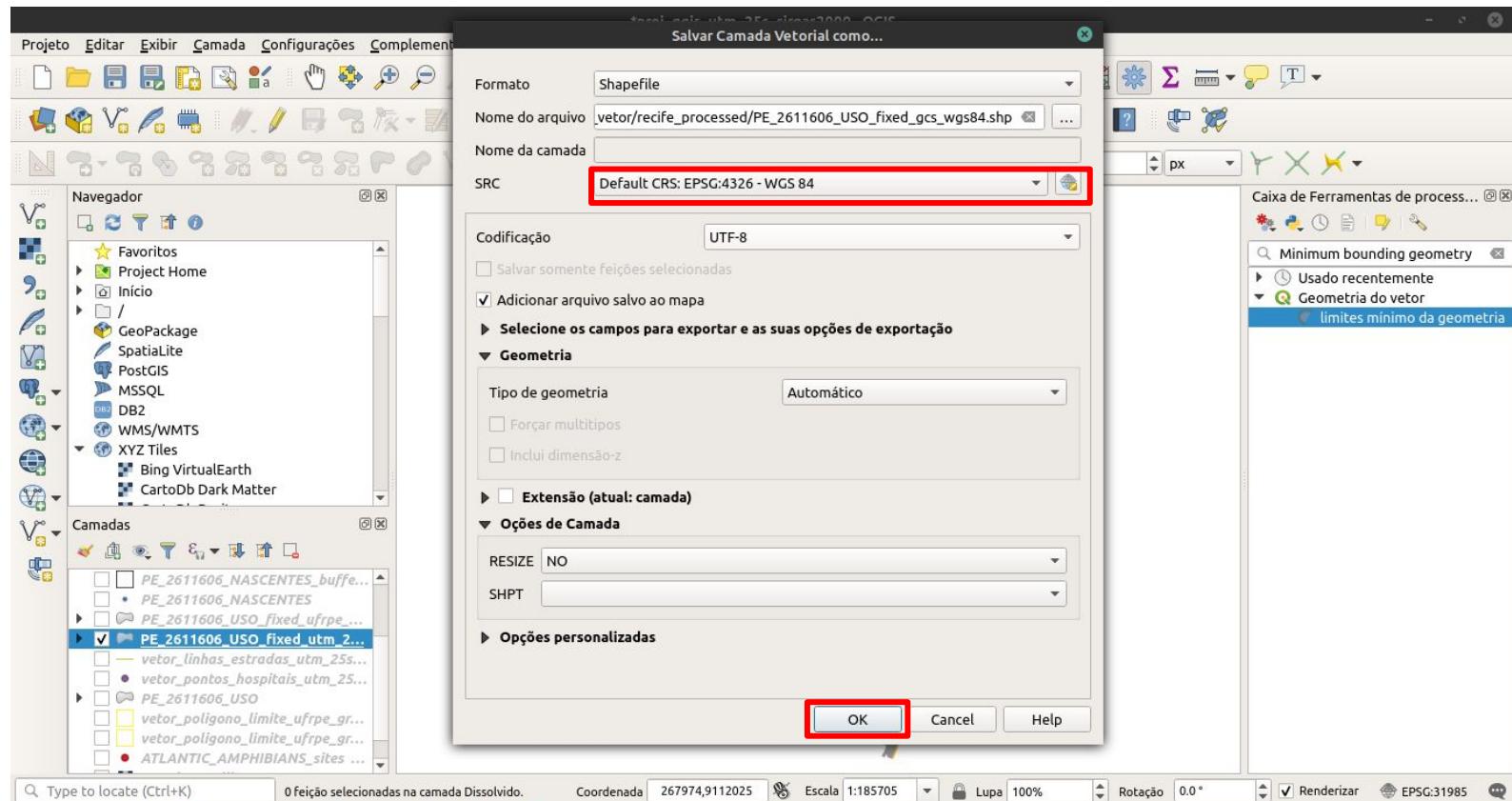
Exportar > Salvar Feições como...



# 7.14 Reprojetar e exportar dados vetoriais

Exportar PE\_2611606\_USO\_fixed\_utm\_25s\_sirgas2000 com coordenadas geográficas e Datum WGS 84

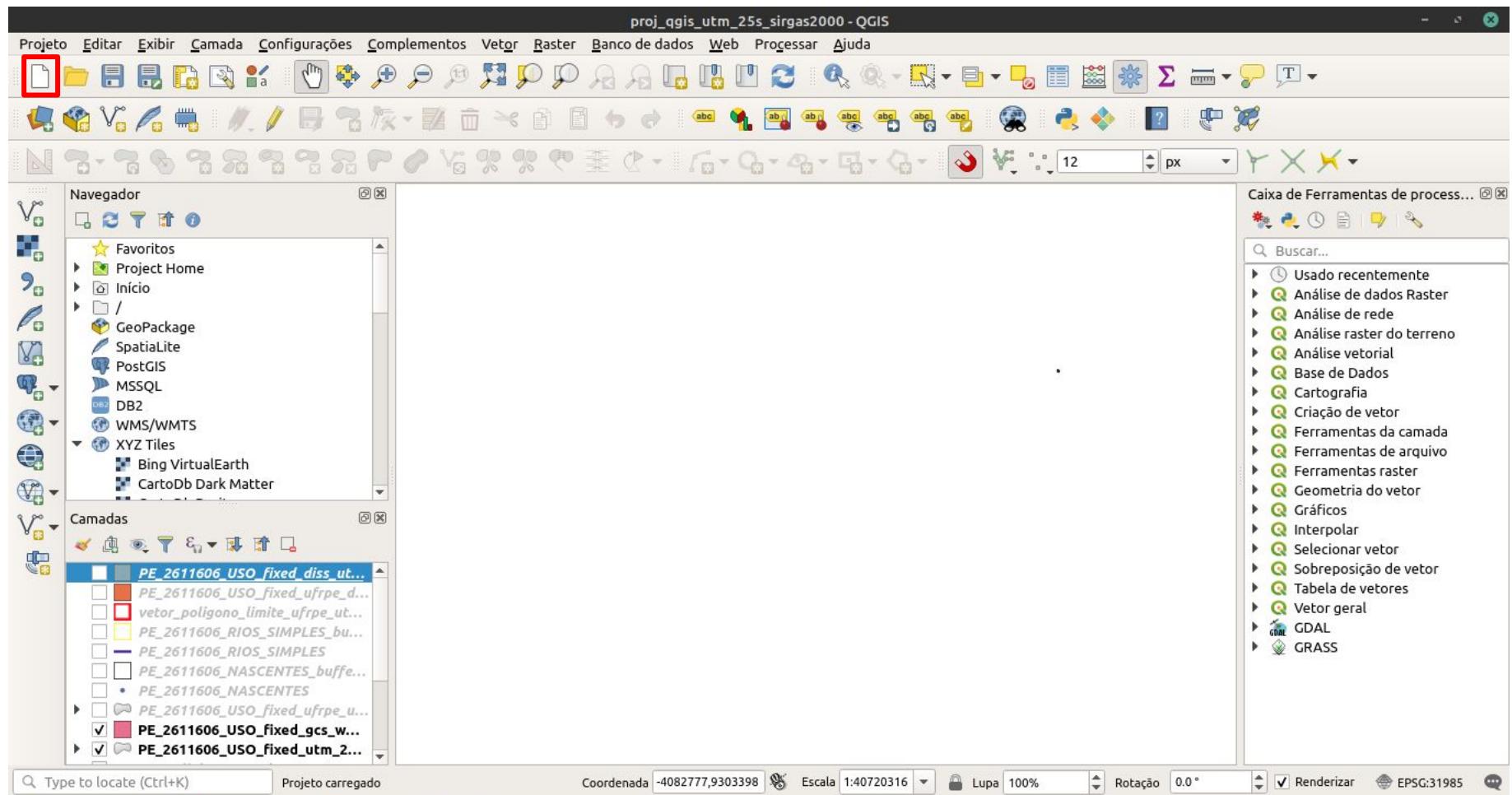
Exportar > Salvar Feições como...



Até agora, tudo bem?

# 7.15 Adicionar dados matriciais preexistentes

Vamos criar um projeto novo sem projeção



## 7.15 Adicionar dados matriciais preexistentes

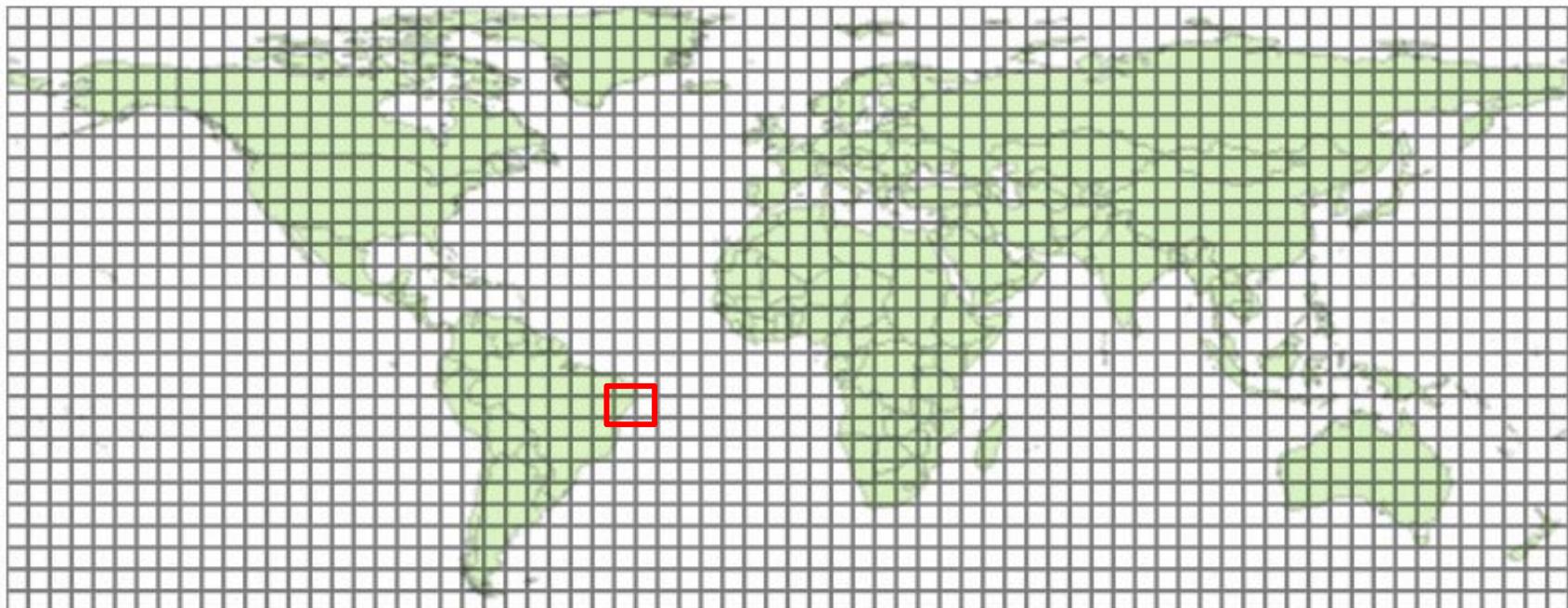
Download de dados matriciais

<https://www.earthenv.org/DEM>

**EarthEnv-DEM90\_S10W035**

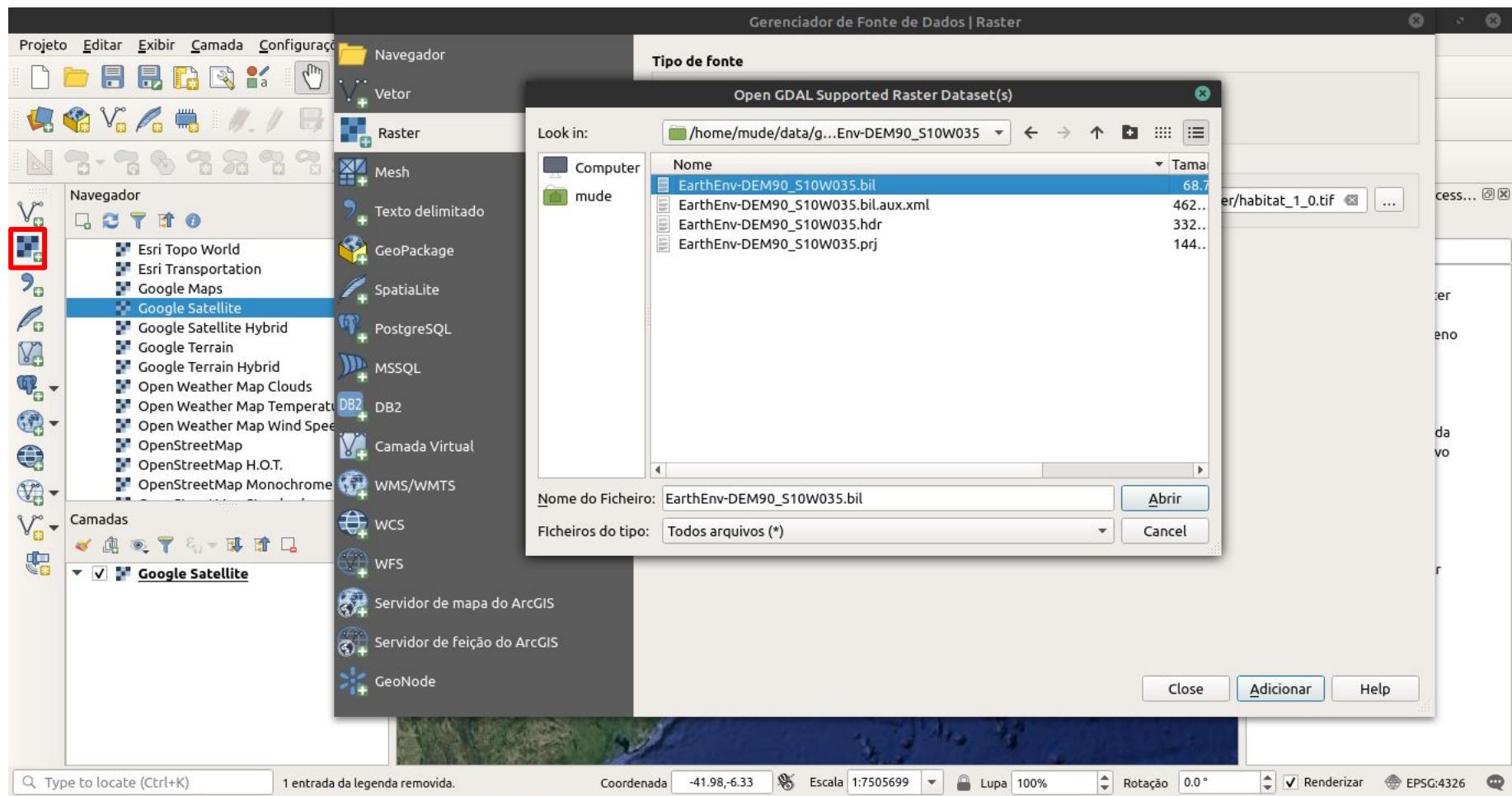
e

**EarthEnv-DEM90\_S10W040**



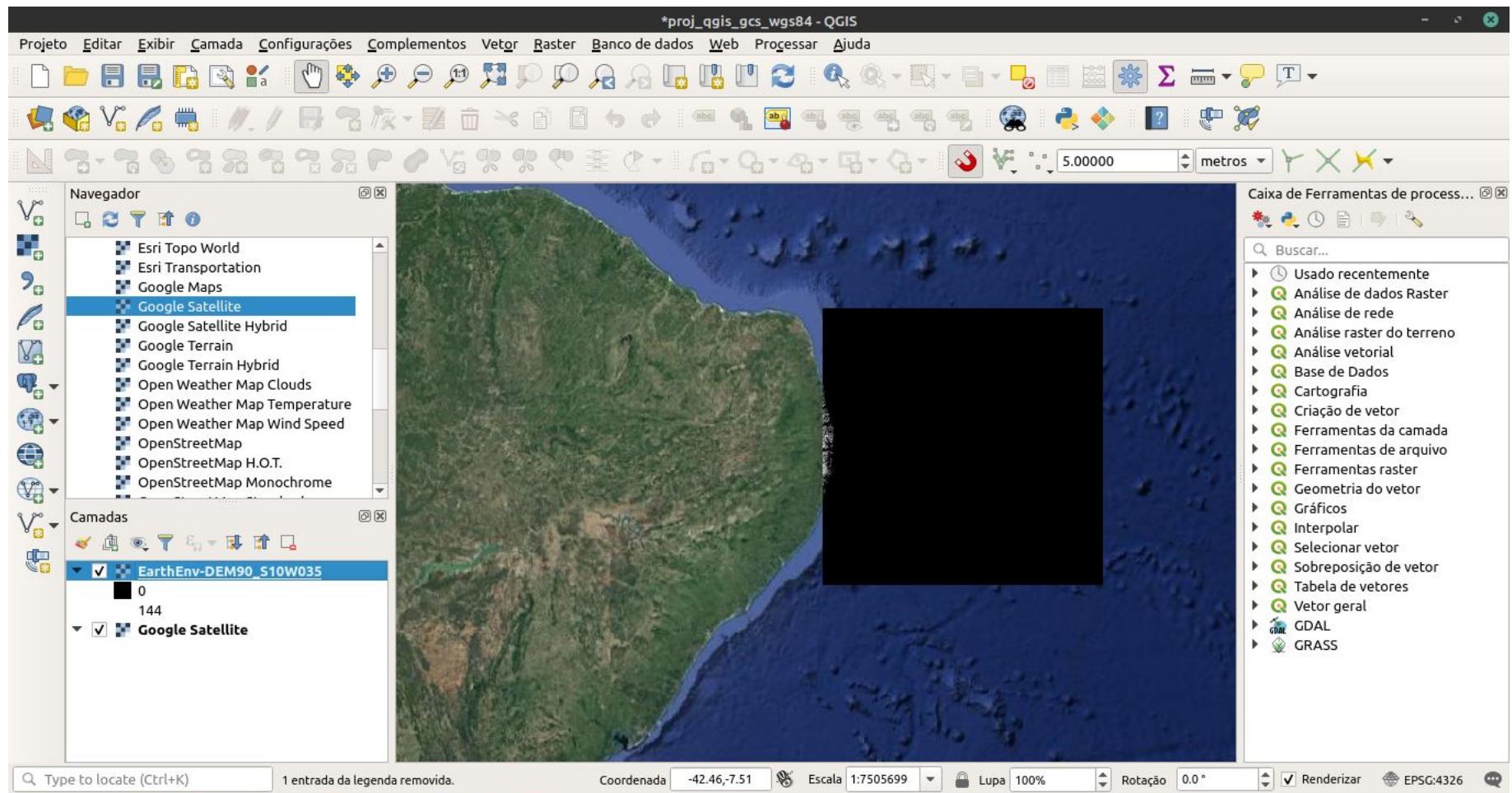
# 7.15 Adicionar dados matriciais preexistentes

## Adicionar dados matriciais (.bil)



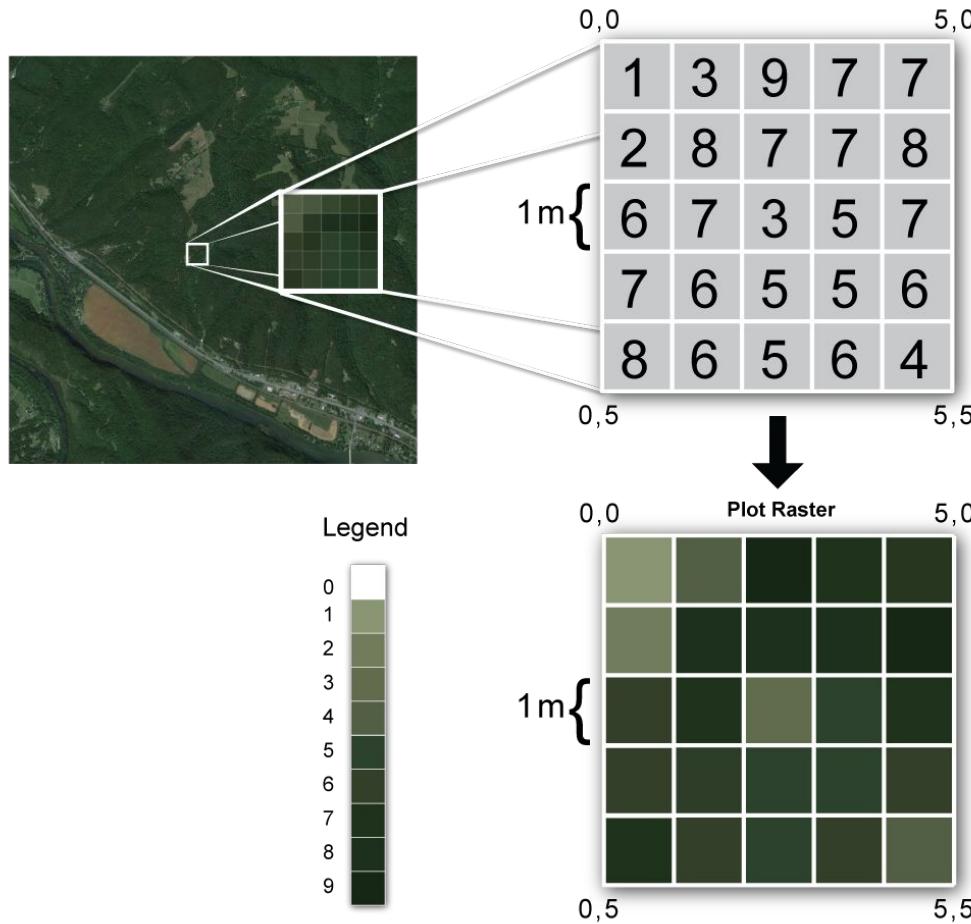
# 7.15 Adicionar dados matriciais preexistentes

## Adicionar dados matriciais (.bil)



# 6.10 Dados matriciais

## Gride ou raster



## 6.11 Formatos de arquivos matriciais

### GeoTiff

Formato aberto de arquivos matriciais georreferenciados

**\*.tif:** arquivo matricial com informações de georreferenciamento

**\*.bil:** arquivo matricial sem informações de georreferenciamento

**\*.hdr:** arquivo de projeção

# 7.16 Propriedades de dados matriciais

## Propriedades

Screenshot of QGIS showing the properties dialog for a raster layer named "EarthEnv-DEM90\_S10W035".

**Information from provider**

<b>Nome</b>	EarthEnv-DEM90_S10W035
<b>Caminho</b>	/home/mude/data/github/disciplina-geoprocessamento/03_dados/02_raster/EarthEnv-DEM90_S10W035/EarthEnv-DEM90_S10W035.bil
<b>SRG</b>	EPSG:4326 - WGS 84 - Geográfico
<b>Extensão</b>	-34.999999999999645,-9.999999999980034 : -30.0000000000019647,-5.0000000000000036
<b>Unidade</b>	graus
<b>Largura</b>	6000
<b>Altura</b>	6000
<b>tipo de dado</b>	Int16 - Inteiro de 16 bits com sinal
<b>GDAL Driver</b>	EHdr
<b>Description</b>	ESRI .hdr Labelled
<b>GDAL Driver Metadata</b>	/home/mude/data/github/disciplina-geoprocessamento/03_dados/02_raster/EarthEnv-DEM90_S10W035/EarthEnv-DEM90_S10W035.bil
<b>Descrição do registro</b>	
<b>Compressão</b>	
<b>Banda 1</b>	<ul style="list-style-type: none"><li>STATISTICS_APPROXIMATE=YES</li><li>STATISTICS_MAXIMUM=144</li><li>STATISTICS_MEAN=0.39020085470085</li><li>STATISTICS_MINIMUM=0</li><li>STATISTICS_STDDEV=4.9880673554559</li><li>STATISTICS_VALID_PERCENT=100</li></ul>
<b>Mais informação</b>	
<b>Dimensões</b>	X: 6000 Y: 6000 Bandas: 1
<b>Origem</b>	-35,-5
<b>Tamanho do Pixel</b>	0.0008333333333329999947,-0.000833333333329999947

**Identificação**

<b>Identifier</b>	
<b>Parent Identifier</b>	
<b>Title</b>	
<b>Type</b>	
<b>Language</b>	

Buttons at the bottom: Estilo, OK, Cancel, Apply, Help.

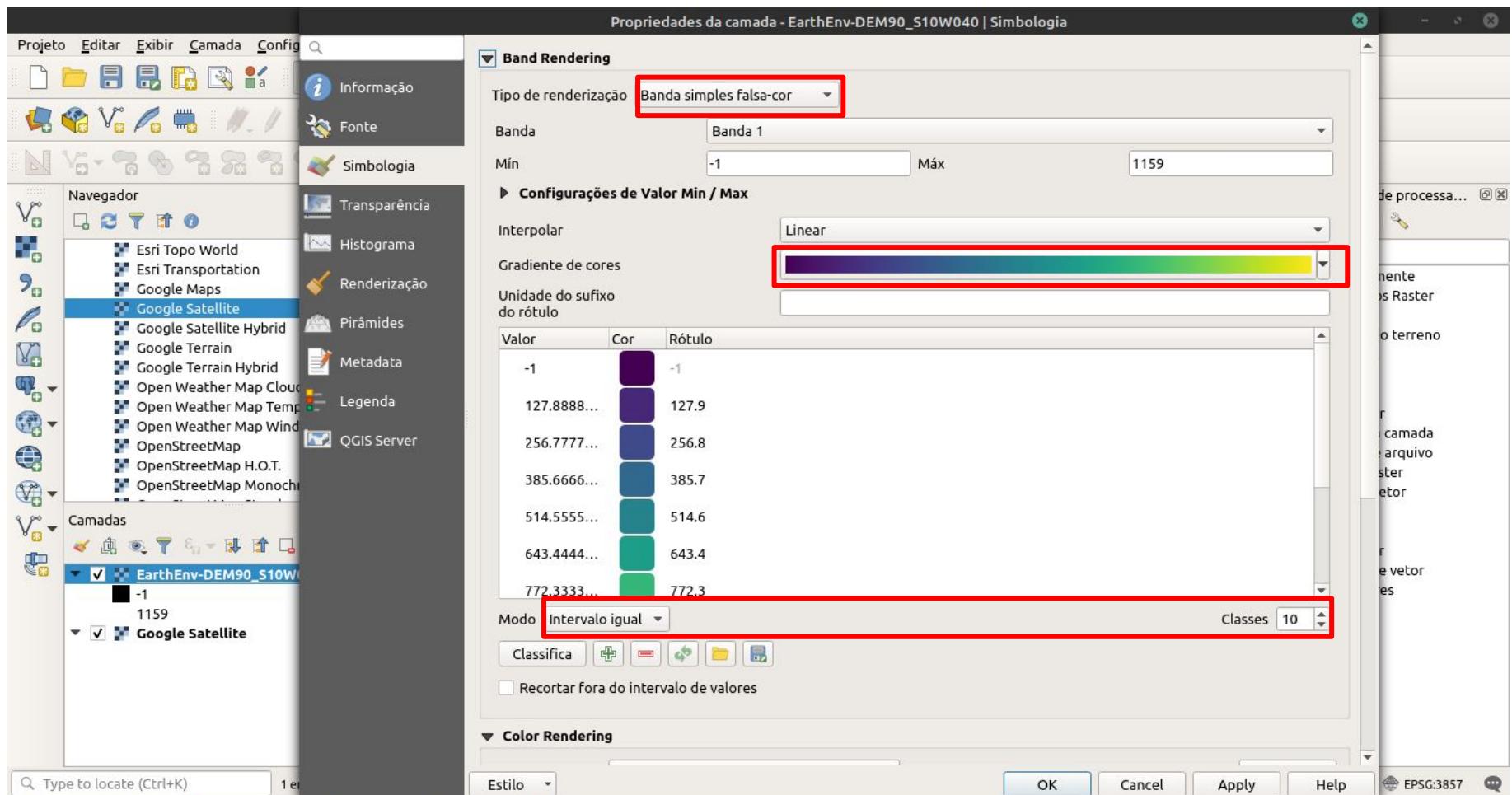
Left sidebar: Projeto, Editar, Exibir, Camada, Configurações. Navegador: Esri Topo World, Esri Transportation, Google Maps, Google Satellite, Google Satellite Hybrid, Google Terrain, Google Terrain Hybrid, Open Weather Map Cloud, Open Weather Map Temp, Open Weather Map Wind, OpenStreetMap, OpenStreetMap H.O.T., OpenStreetMap Monochrom. Camadas: EarthEnv-DEM90\_S10W035, Google Satellite.

Right sidebar: Caixa de Ferramentas de processamento: Usado recentemente, Análise de dados Raster, Análise de rede, Análise raster do terreno, Análise vetorial, Base de Dados, Cartografia, Criação de vetor, Ferramentas da camada, Ferramentas de arquivo, Ferramentas raster, Geometria do vetor, Gráficos, Interpolar, Selecionar vetor, Sobreposição de vetor, Tabela de vetores, Vetor geral, GDAL, GRASS.

Bottom status bar: Type to locate (Ctrl+K), 1, Renderizar, EPSG:4326.

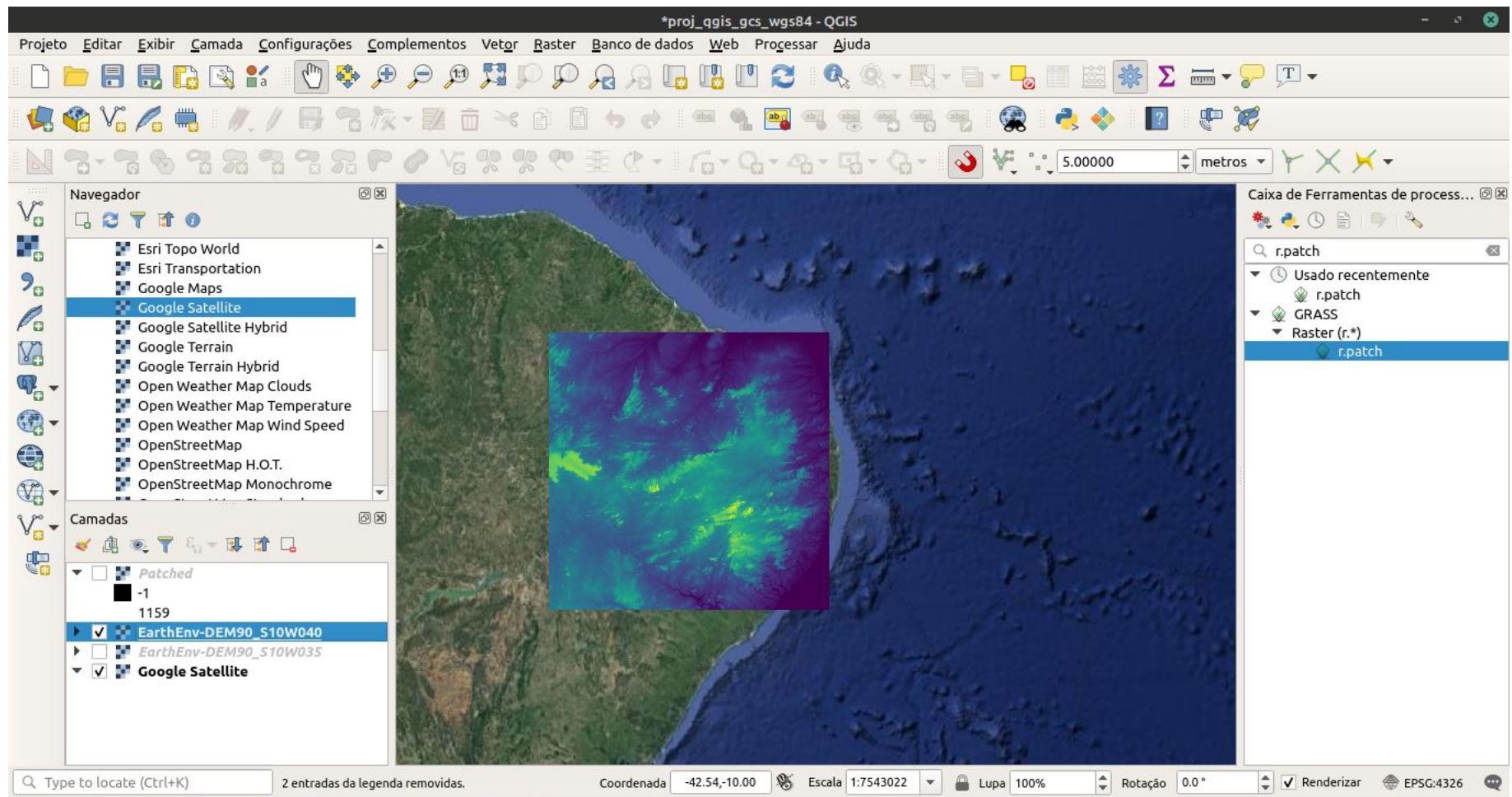
# 7.16 Propriedades de dados matriciais

## Simbologia



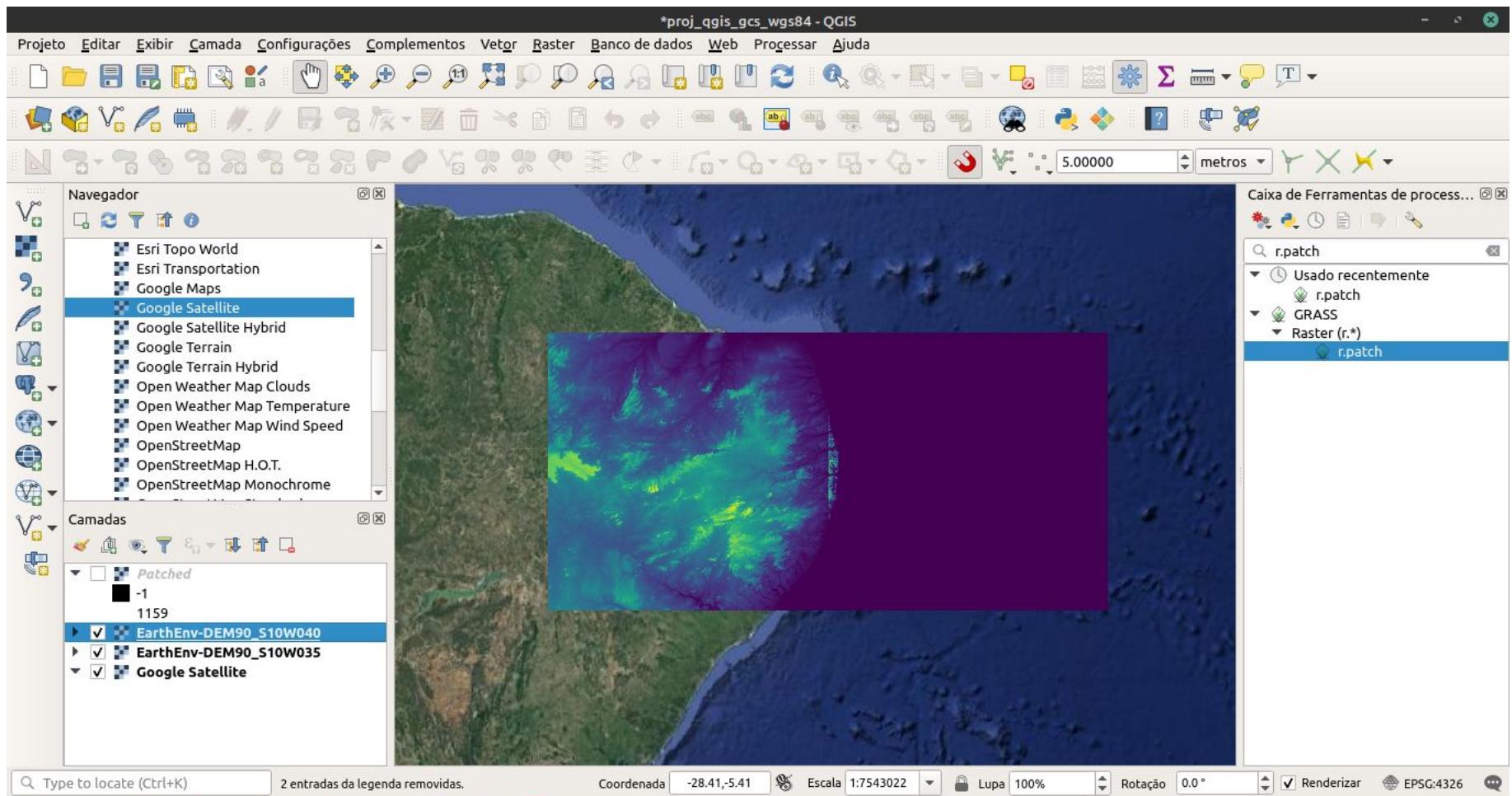
# 7.16 Propriedades de dados matriciais

## Simbologia



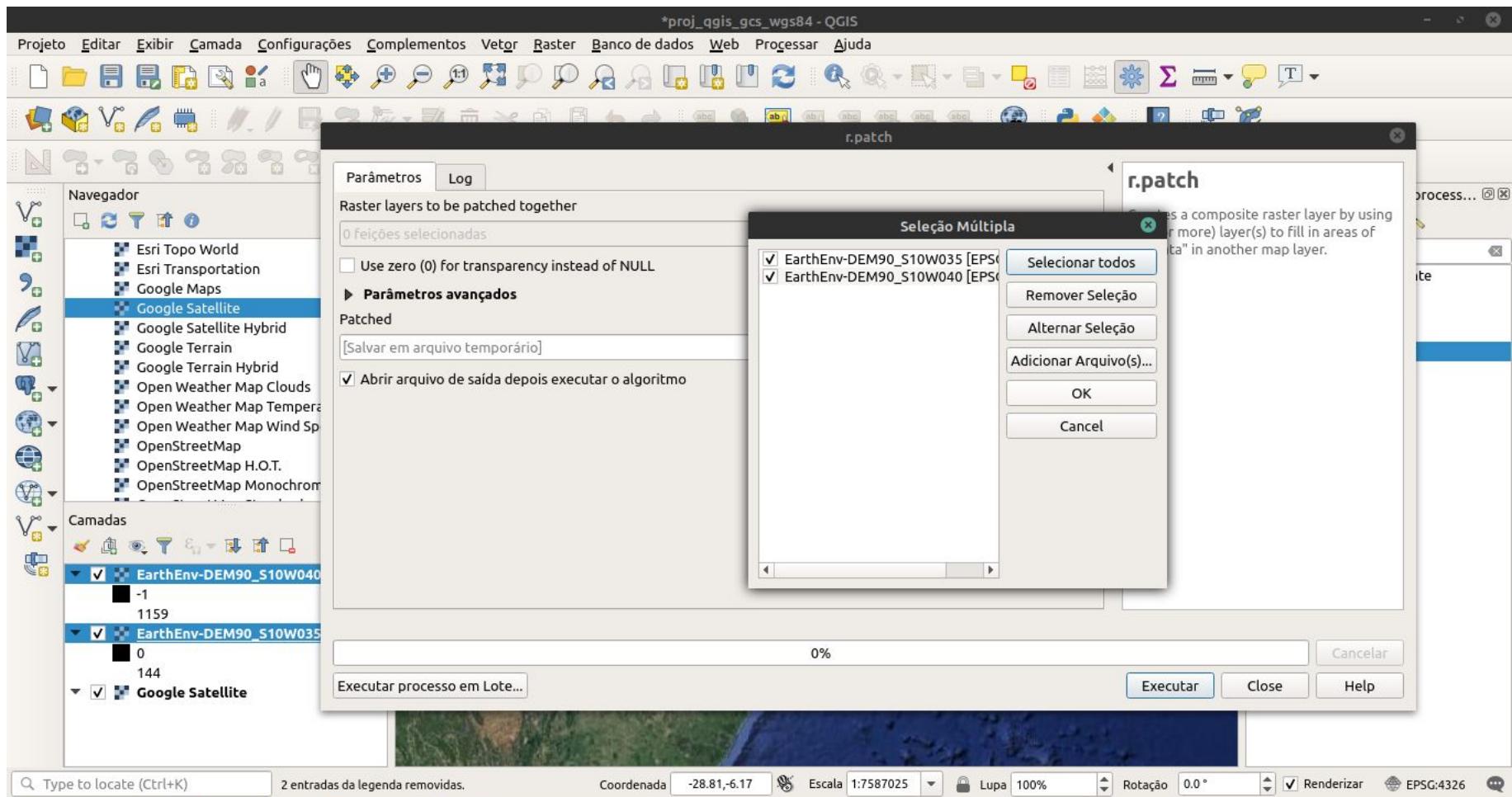
# 7.17 Mosaico (unir raster)

## Unir rasters (r.patch)



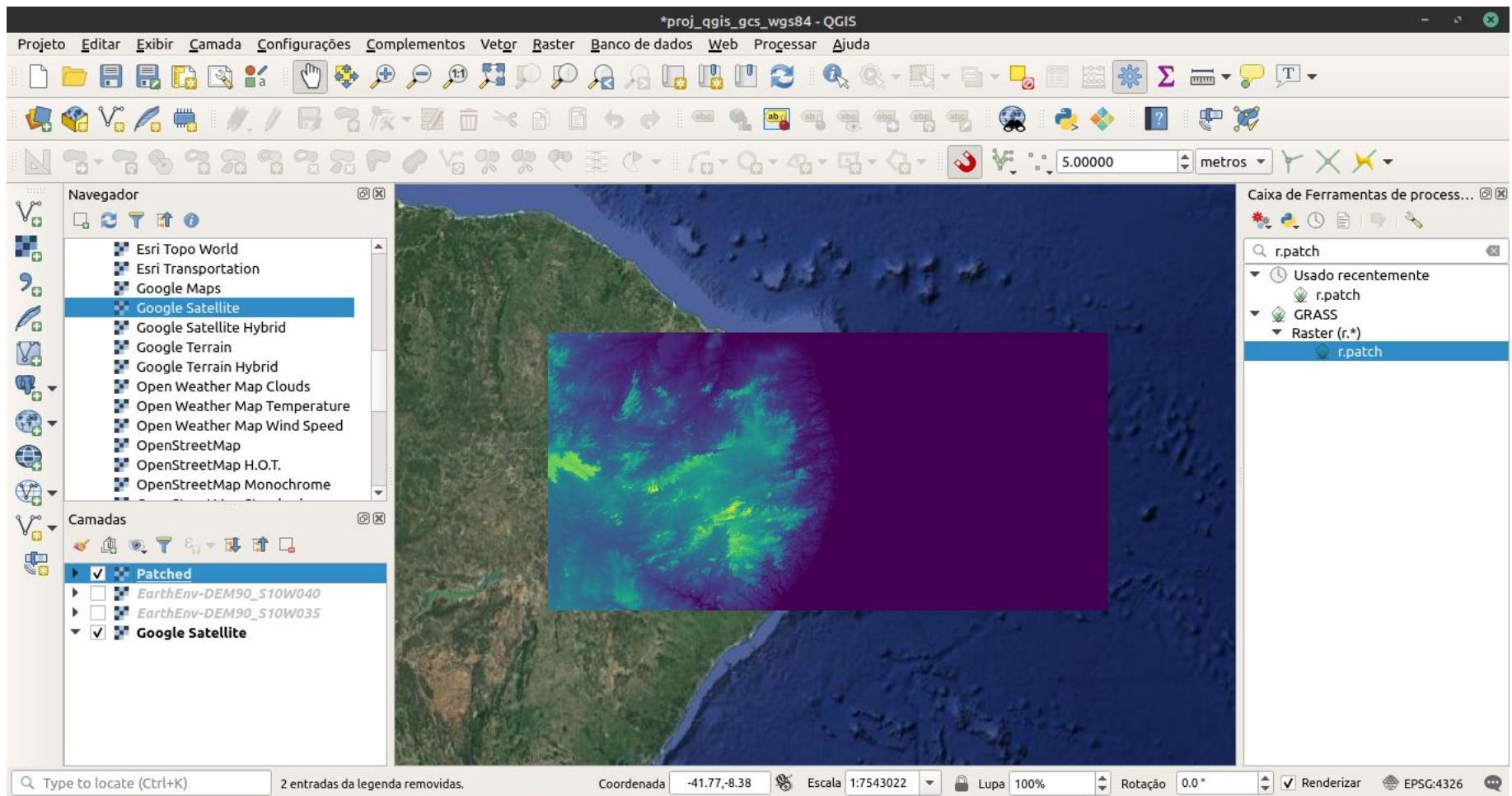
# 7.17 Mosaico (unir raster)

## Unir rasters (r.patch)



# 7.17 Mosaico (unir raster)

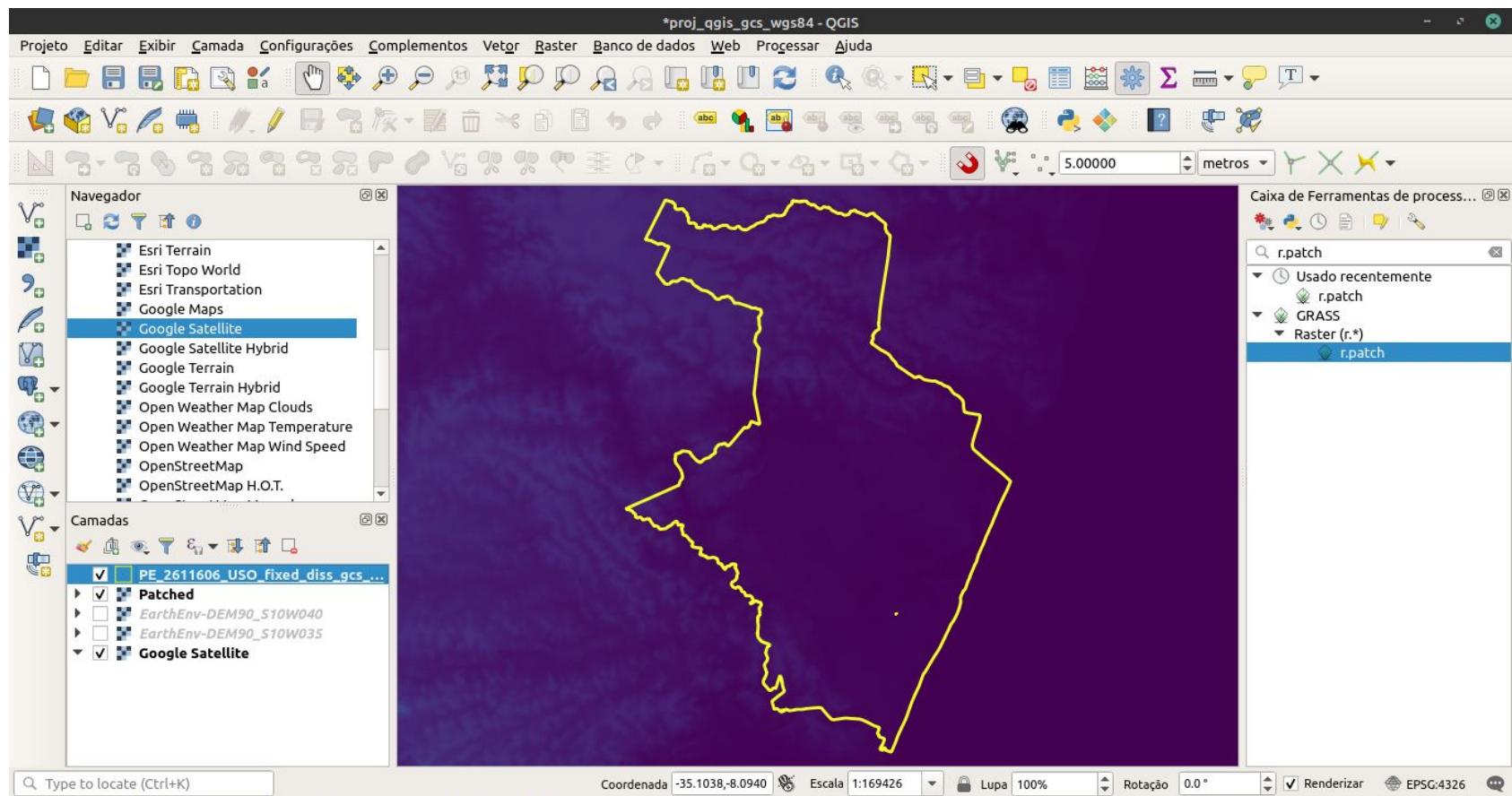
## Unir rasters (r.patch)



# 7.18 Recorte (extração de máscara)

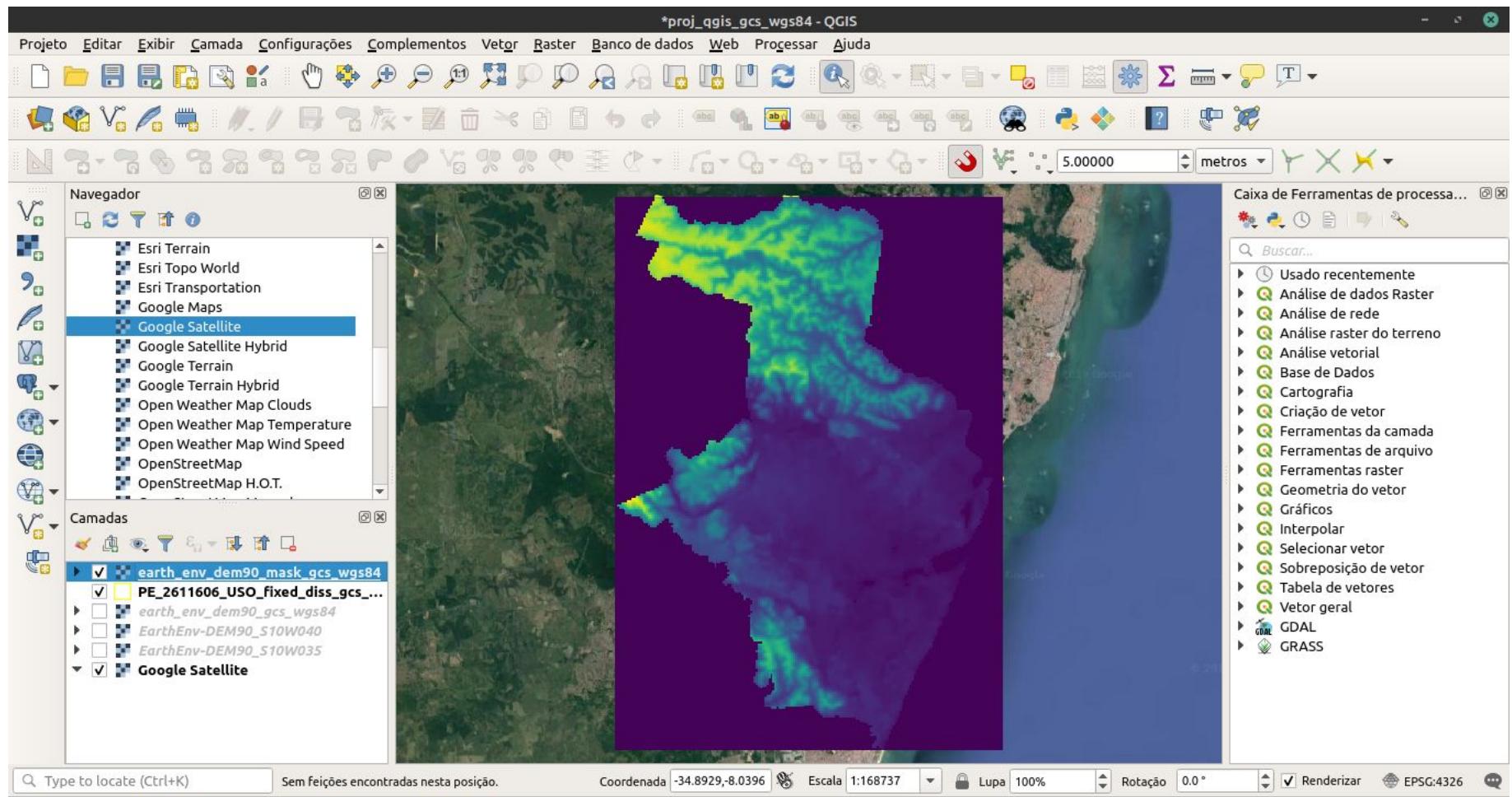
## Ajustar raster à um vetor

Raster > Extrair > Recortar raster pela camada de máscara



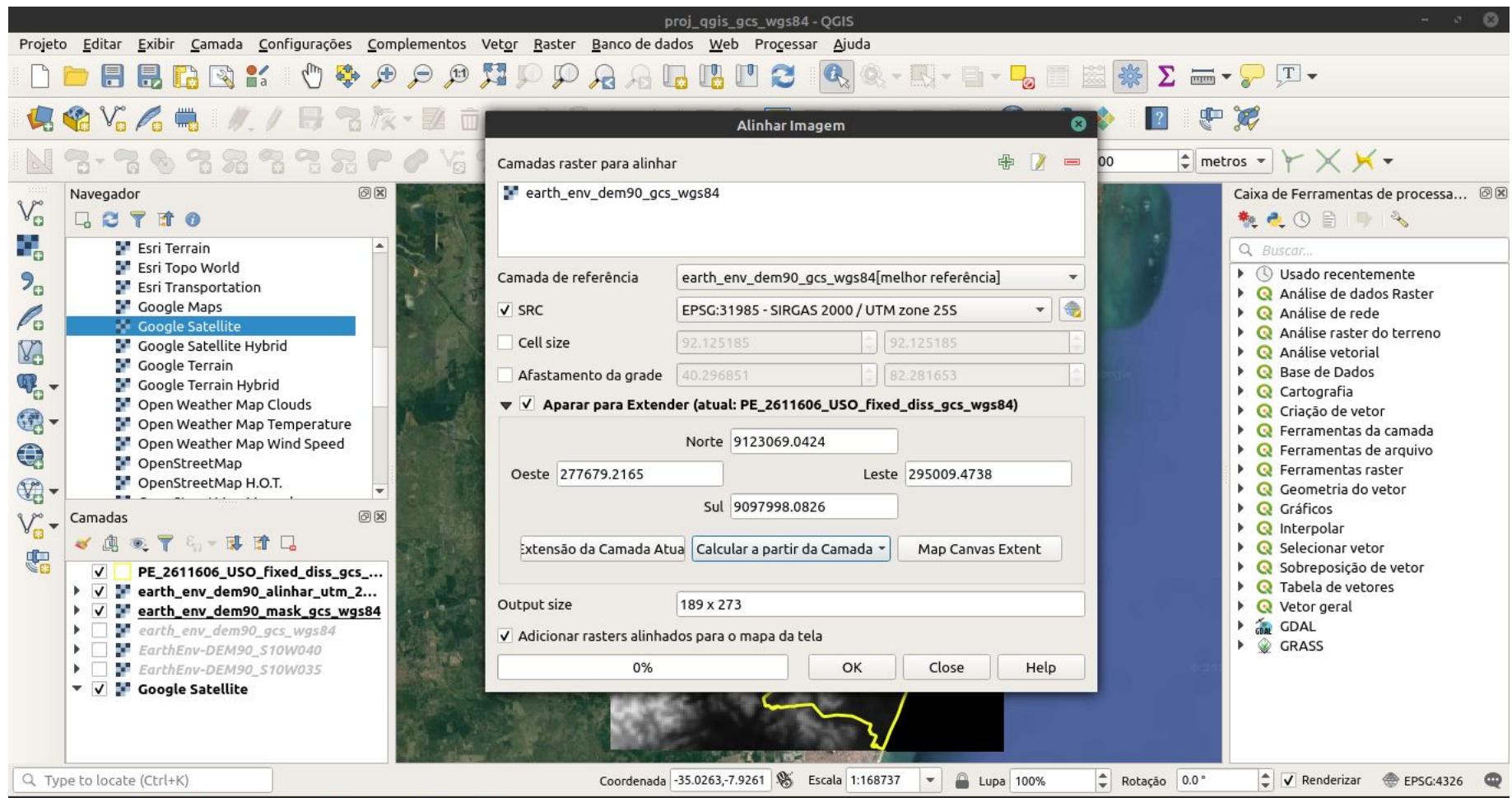
# 7.18 Recorte (extração de máscara)

## Ajustar raster à um vetor



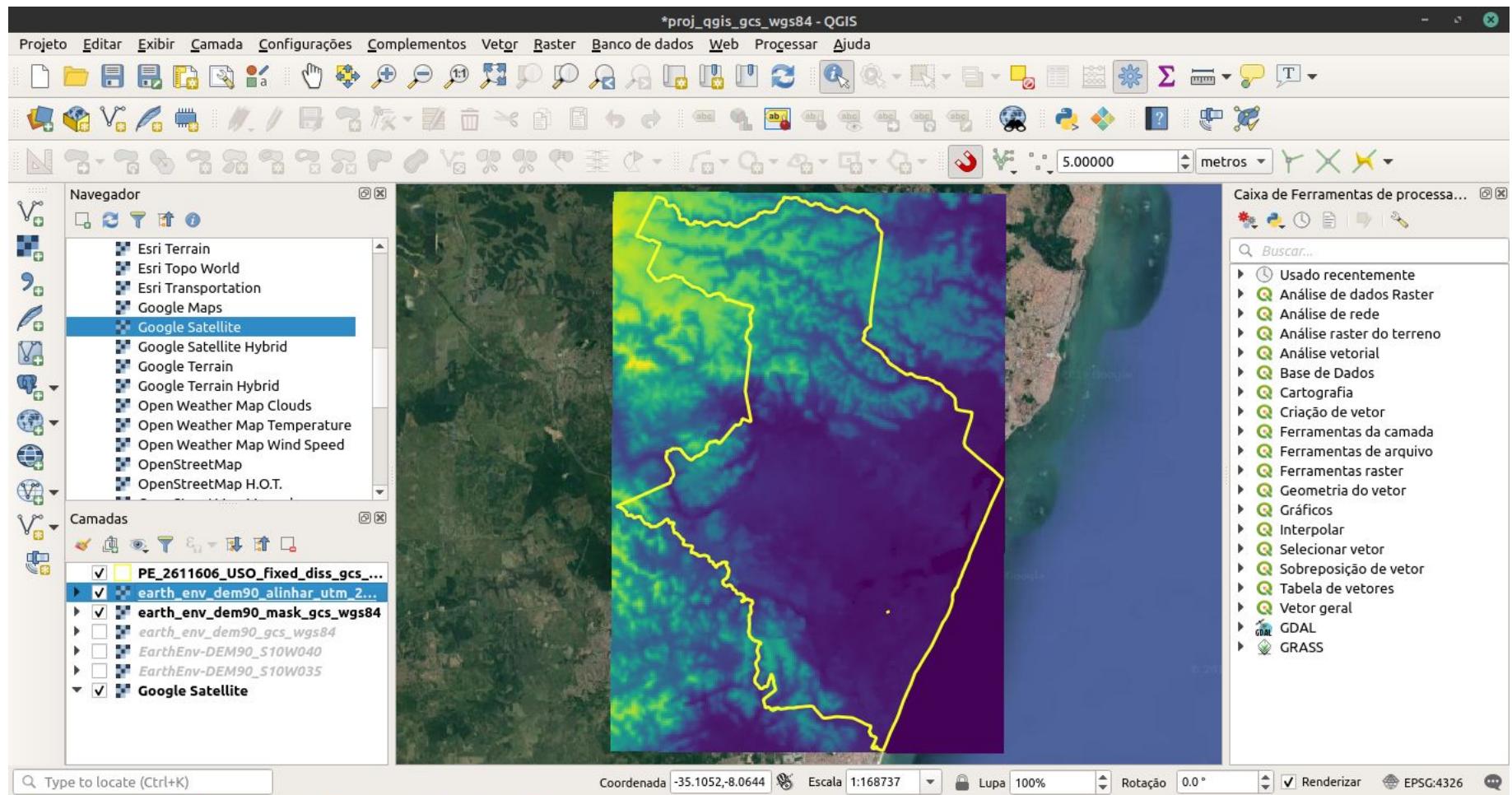
# 7.19 Alinhar raster

## Ajusta extensão, resolução e projeção



# 7.19 Alinhar raster

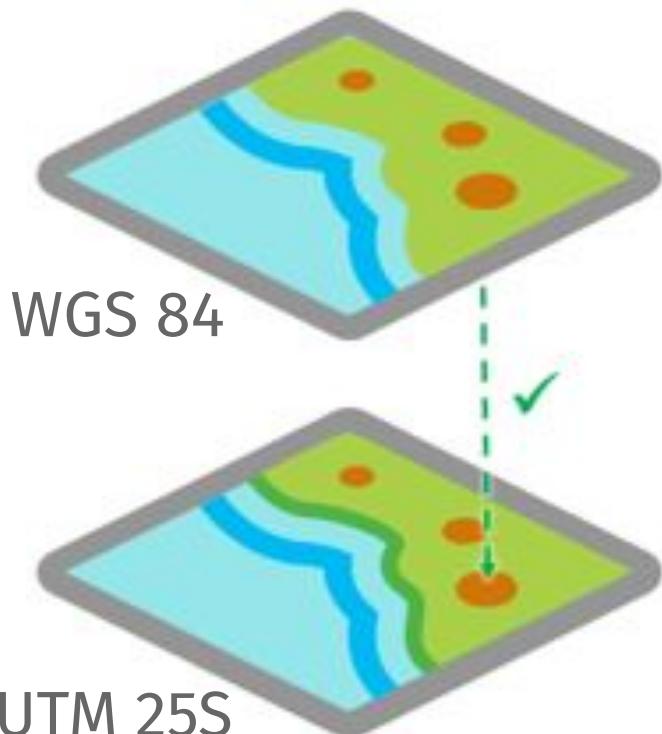
## Ajusta extensão, resolução e projeção



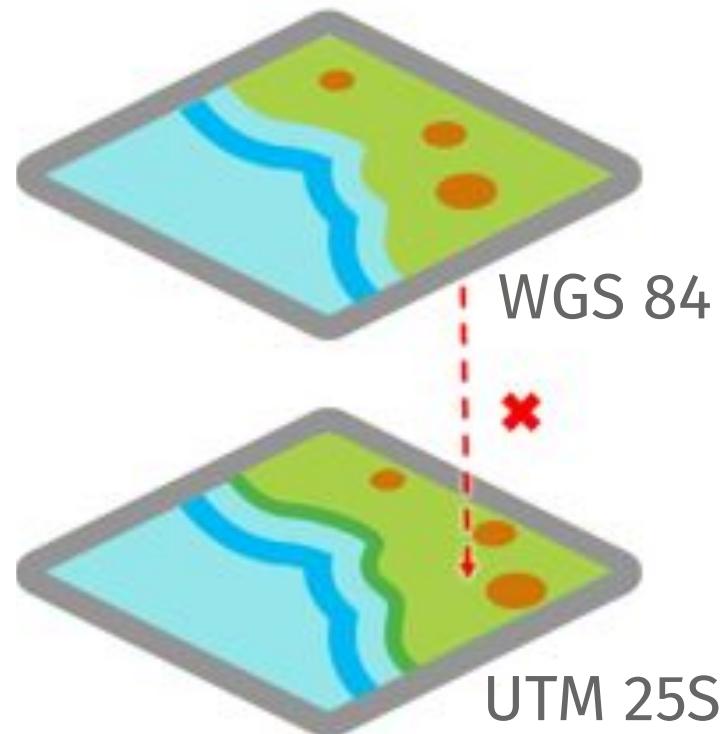
## 7.4 Projeto no QGIS

Reprojeção *on the fly*

Com *on the fly*

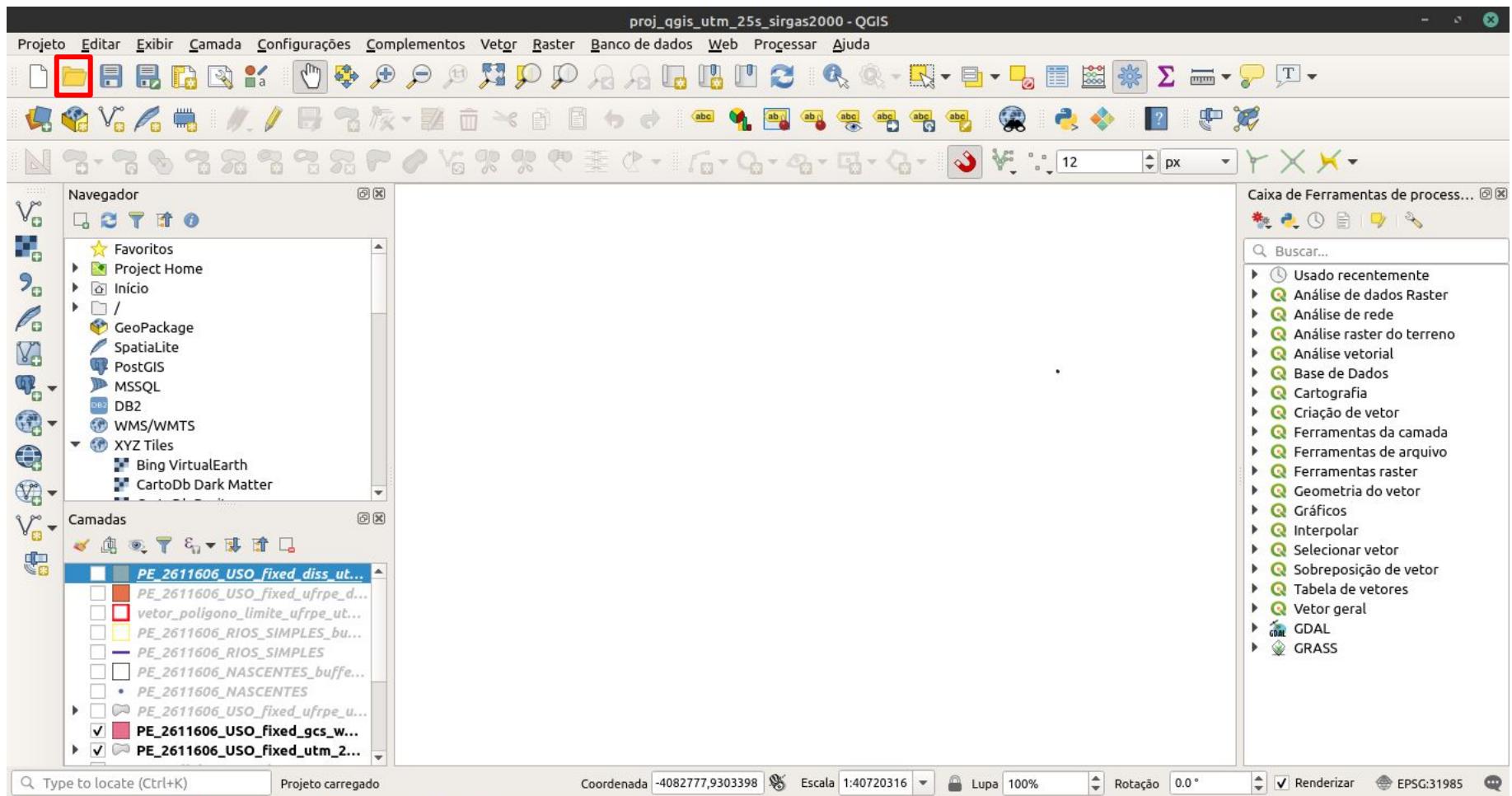


Sem *on the fly*



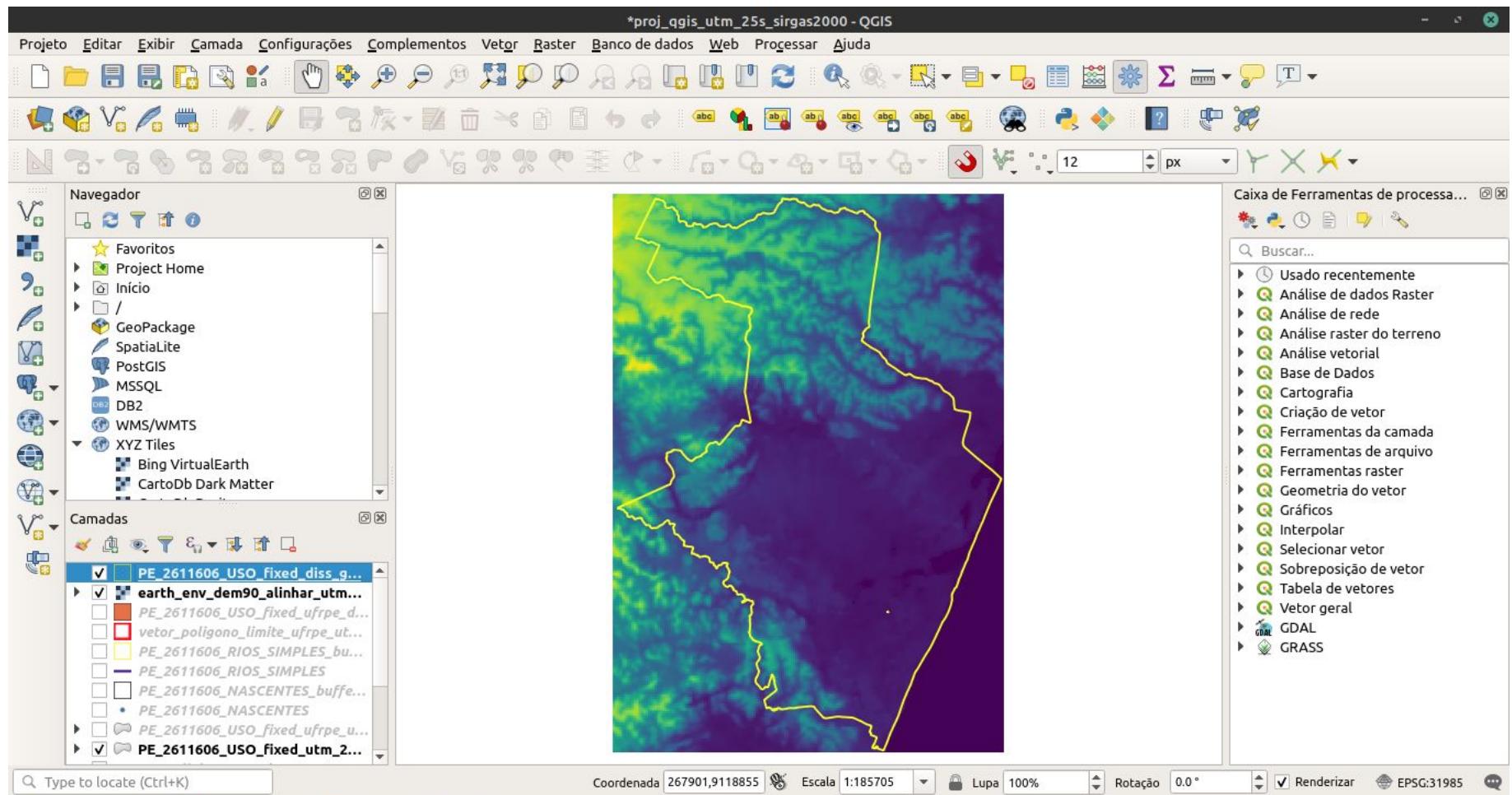
# 7.20 Topografia

Vamos abrir o projeto proj\_qgis\_utm\_25s\_sirgas2000.qgz



# 7.20 Topografia

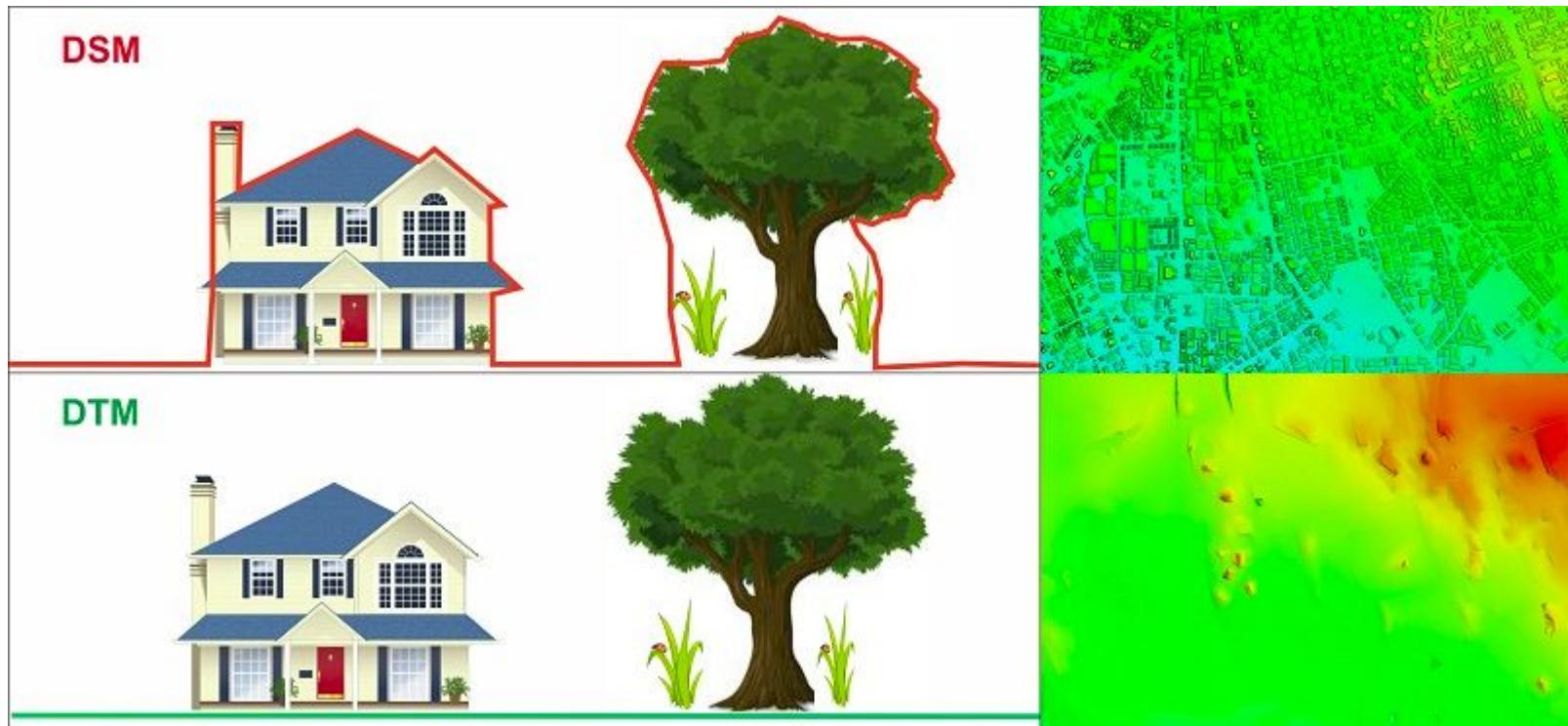
Vamos adicionar o raster reprojetado



## 7.20 Topografia

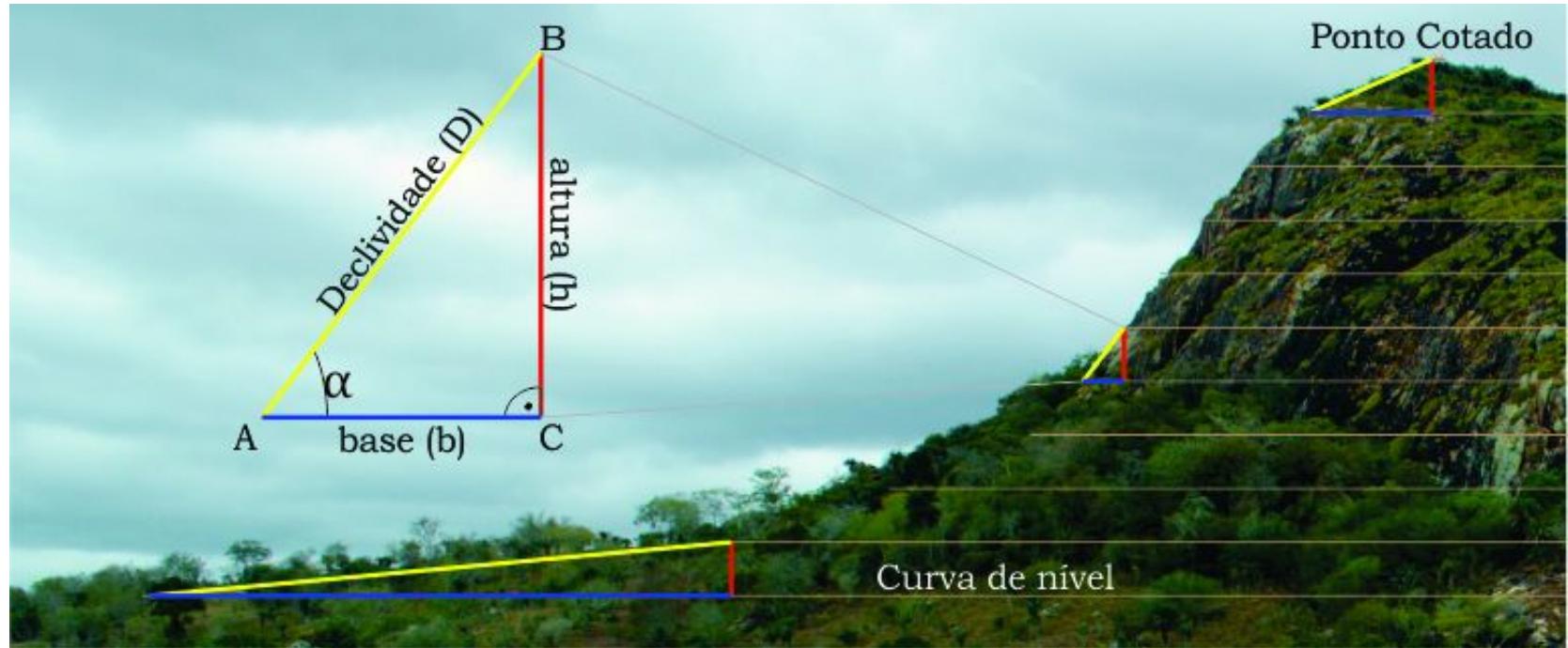
DEM, DSM e DTM

Modelo Digital de Elevação, Superfície e Terreno



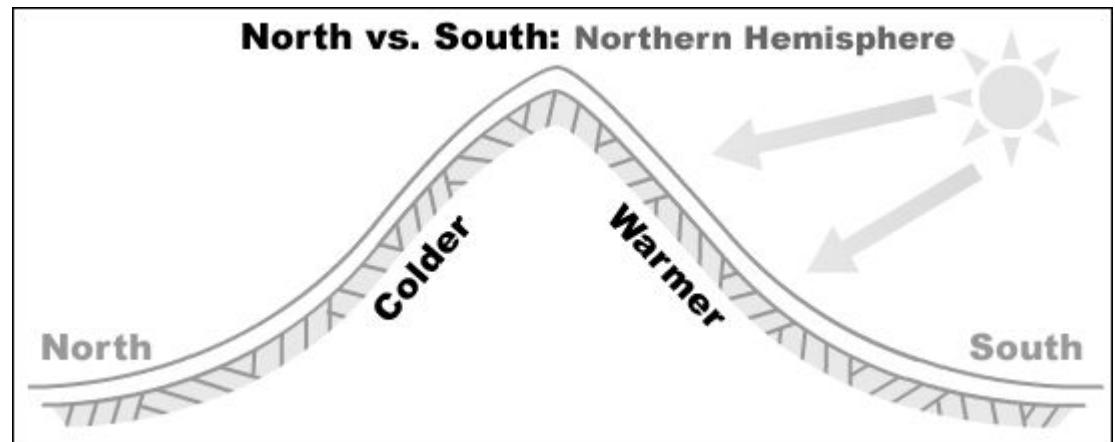
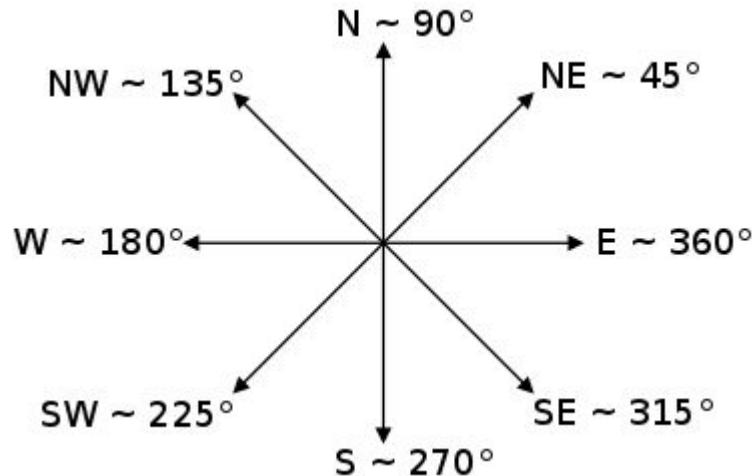
## 7.20 Topografia

### Declividade



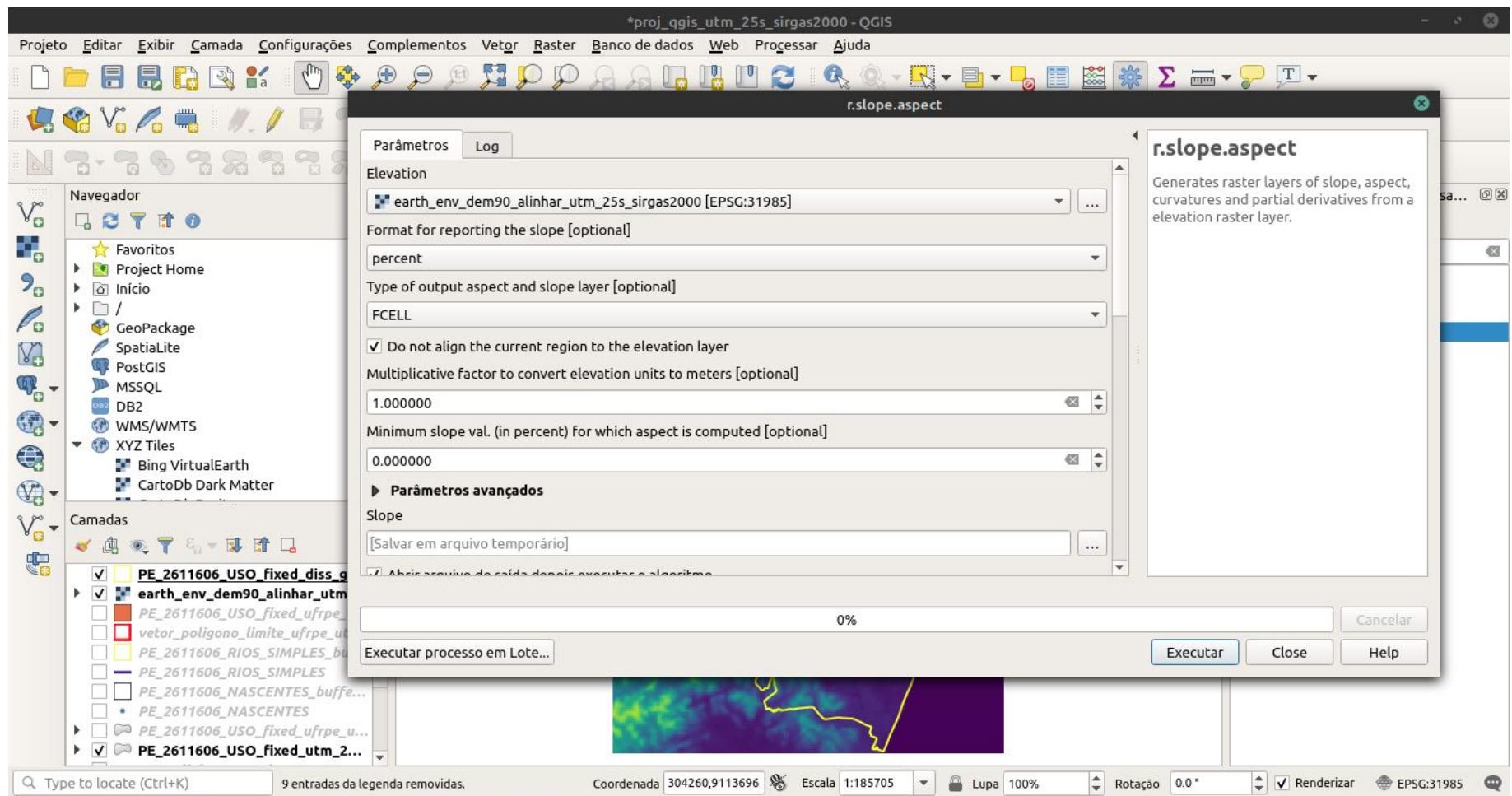
# 7.20 Topografia

## Aspecto



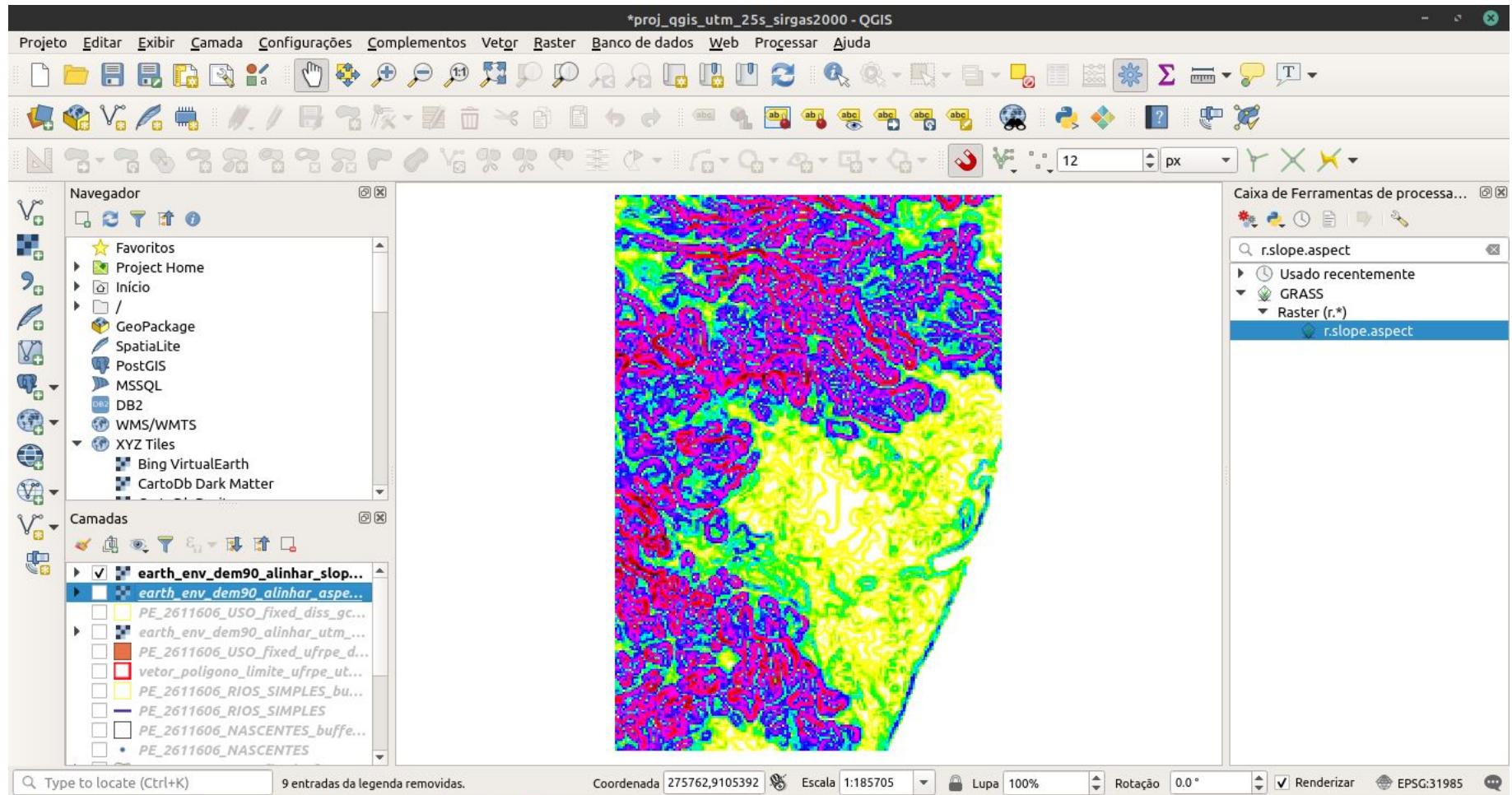
# 7.20 Topografia

## Declividade e Aspecto (r.slope.aspect)



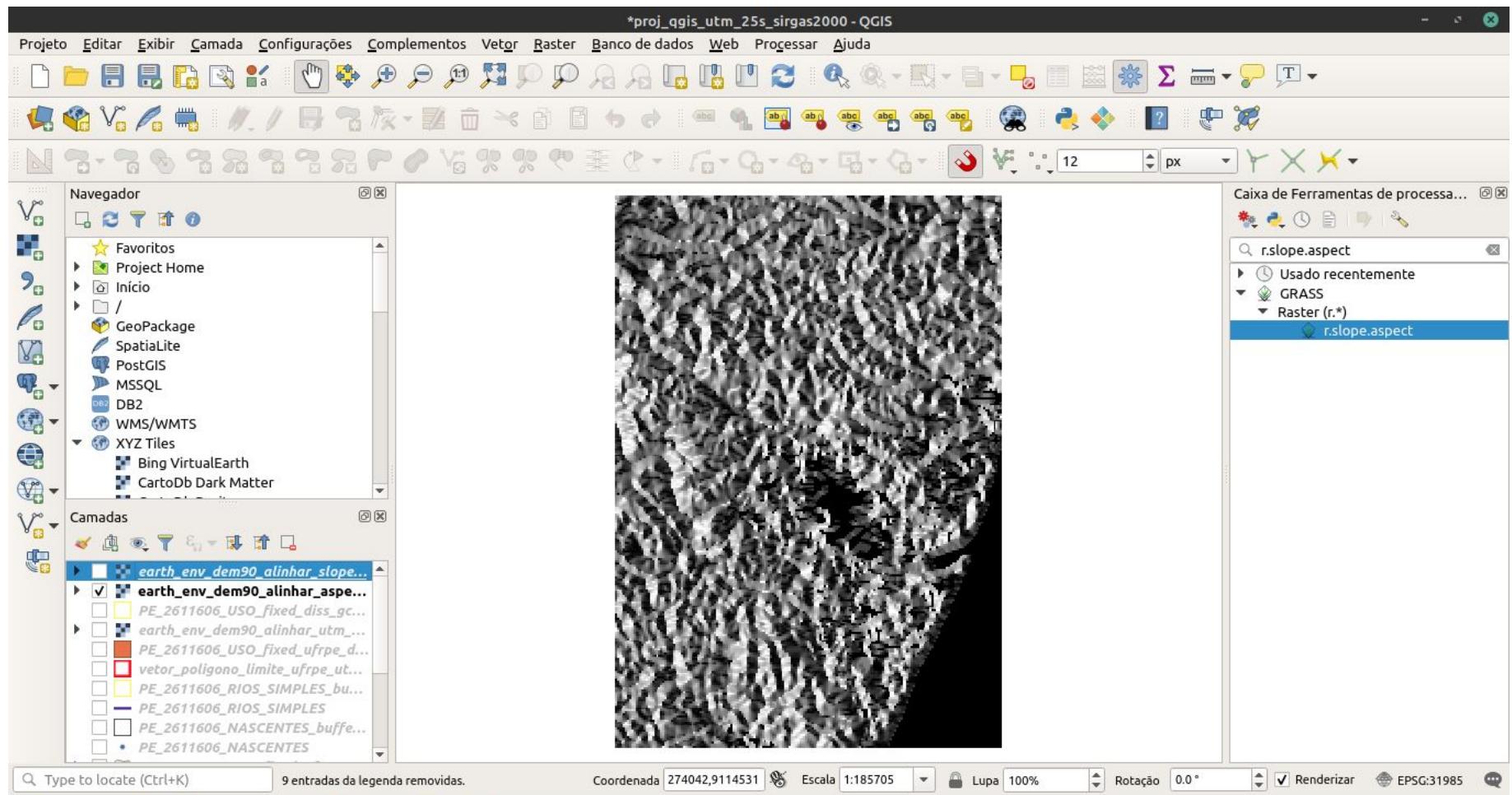
# 7.20 Topografia

## Declividade



# 7.20 Topografia

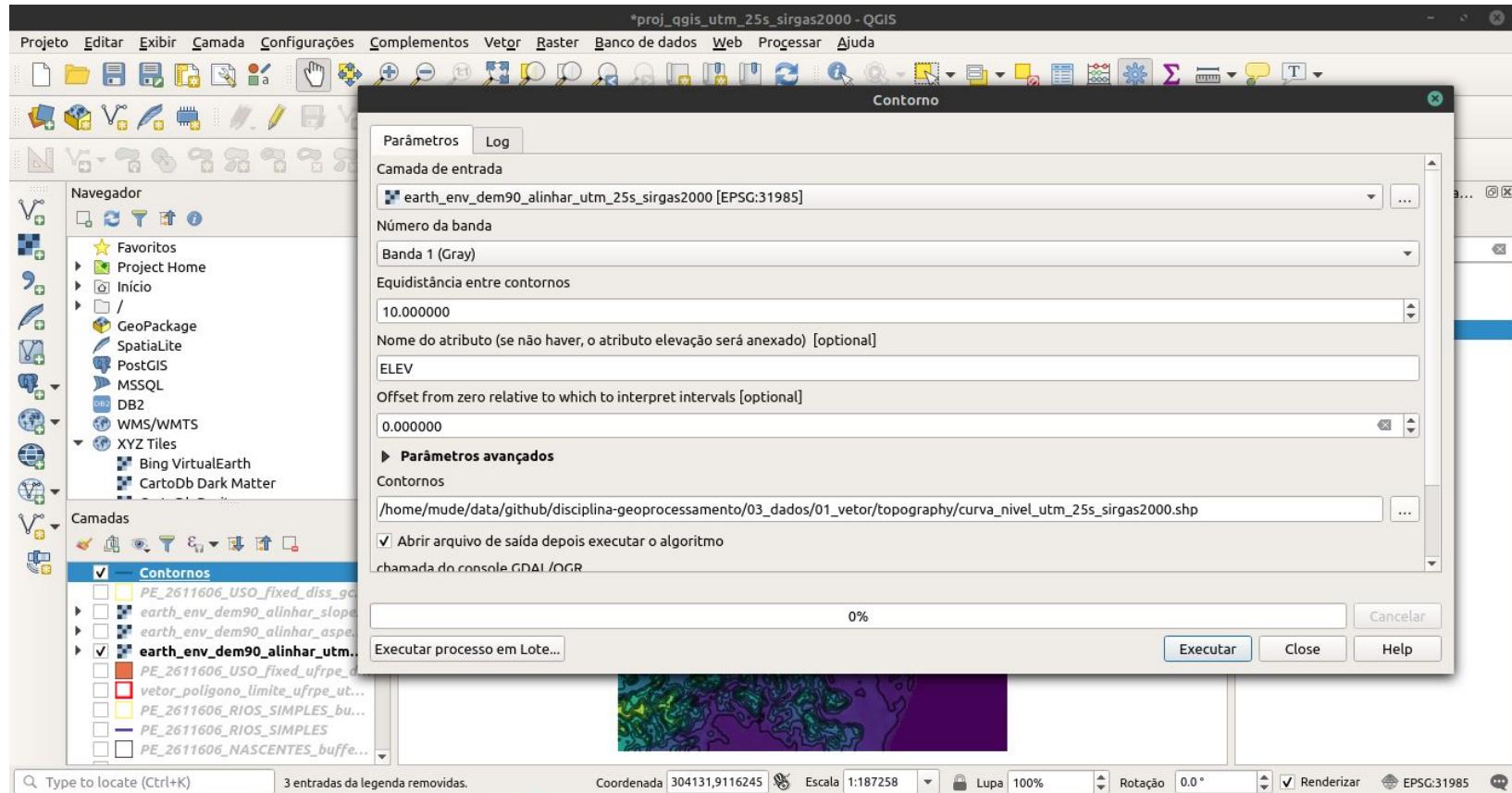
## Aspecto



# 7.20 Topografia

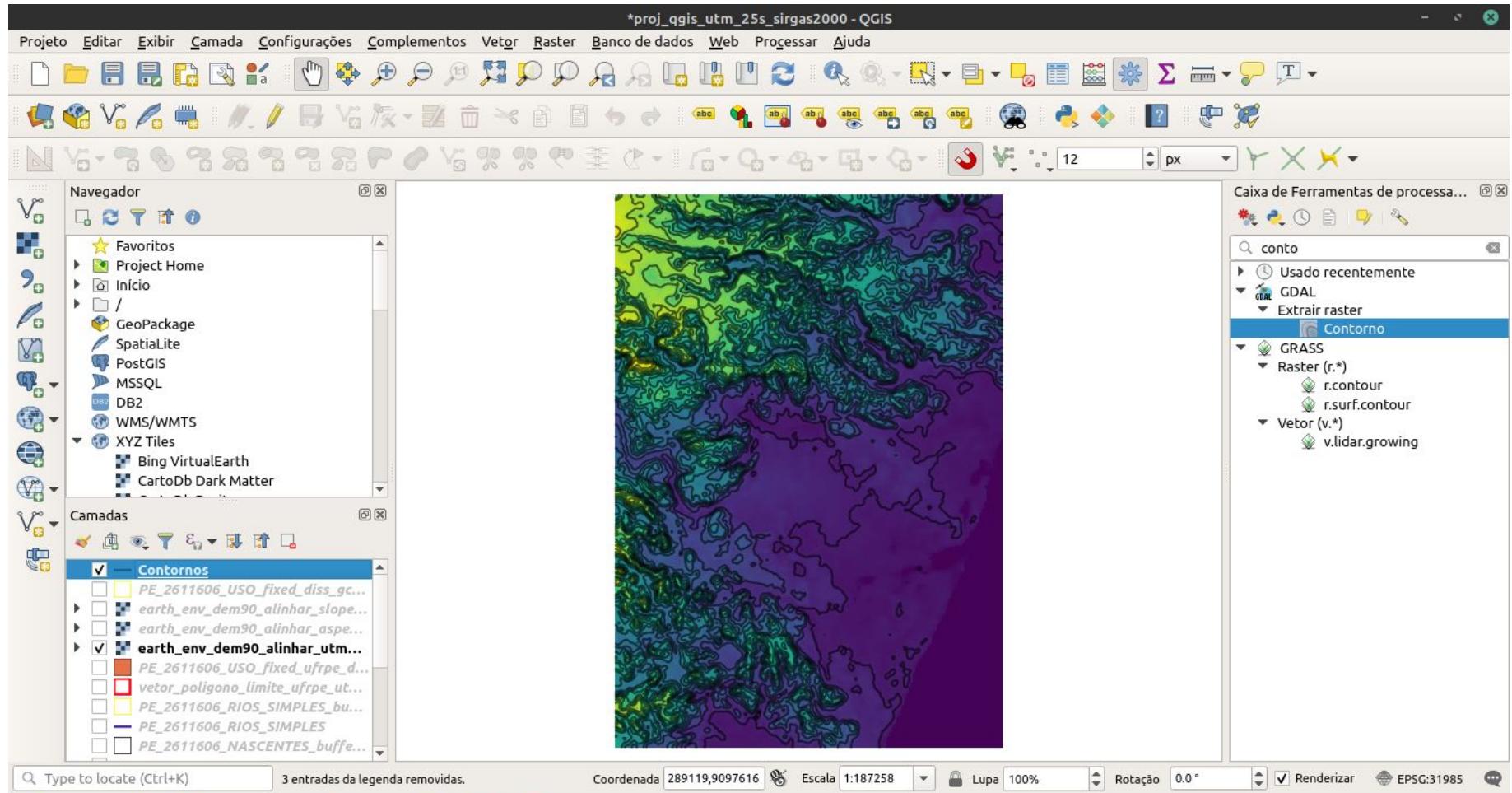
## Curva de nível

Raster > Extrair > Contorno



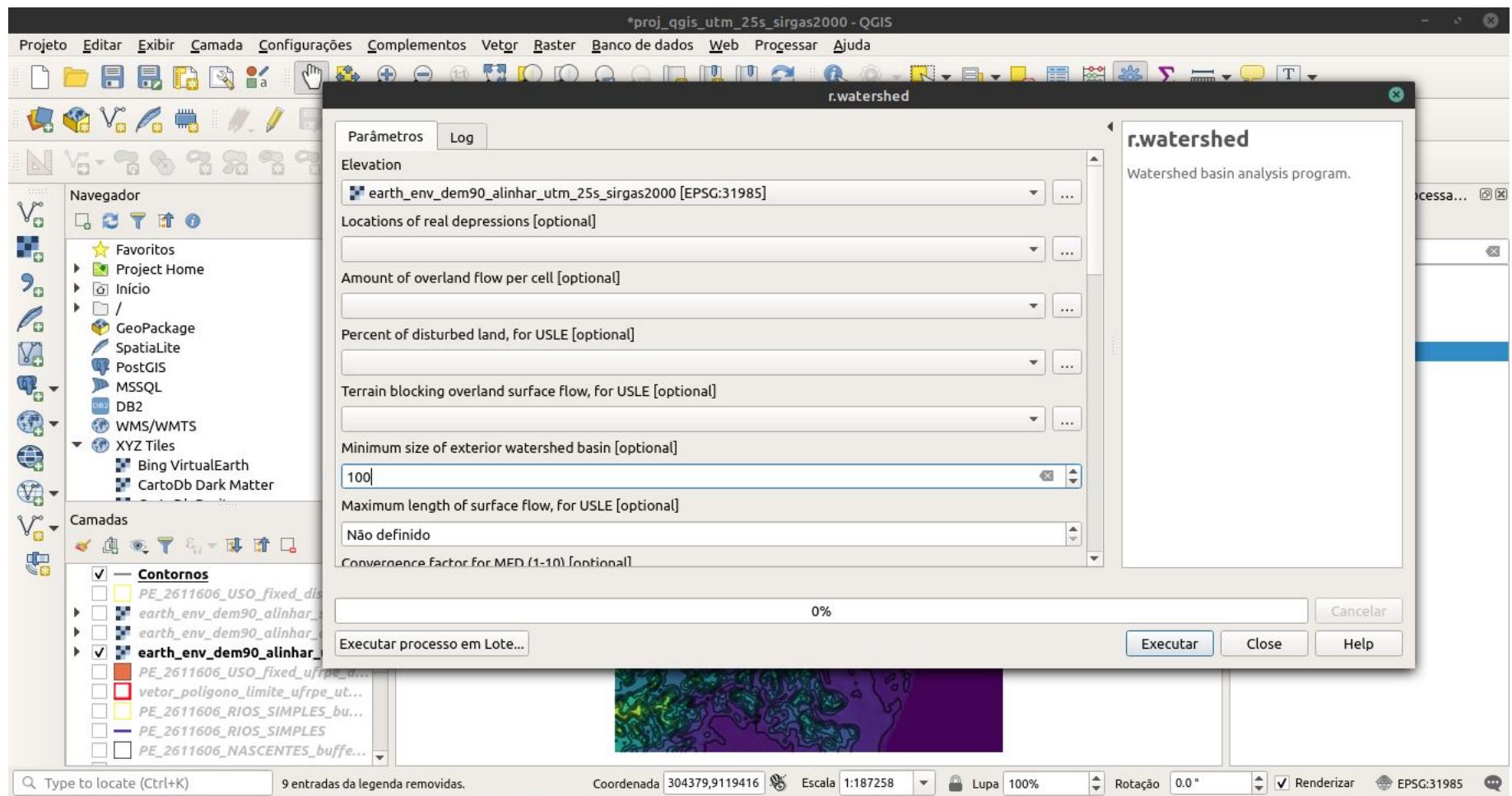
# 7.20 Topografia

## Curva de nível



# 7.20 Topografia

## Bacia hidrográfica e rios (r.watershed)



## 7.20 Topografia

Bacia hidrográfica e rios (r.watershed)

Elevation

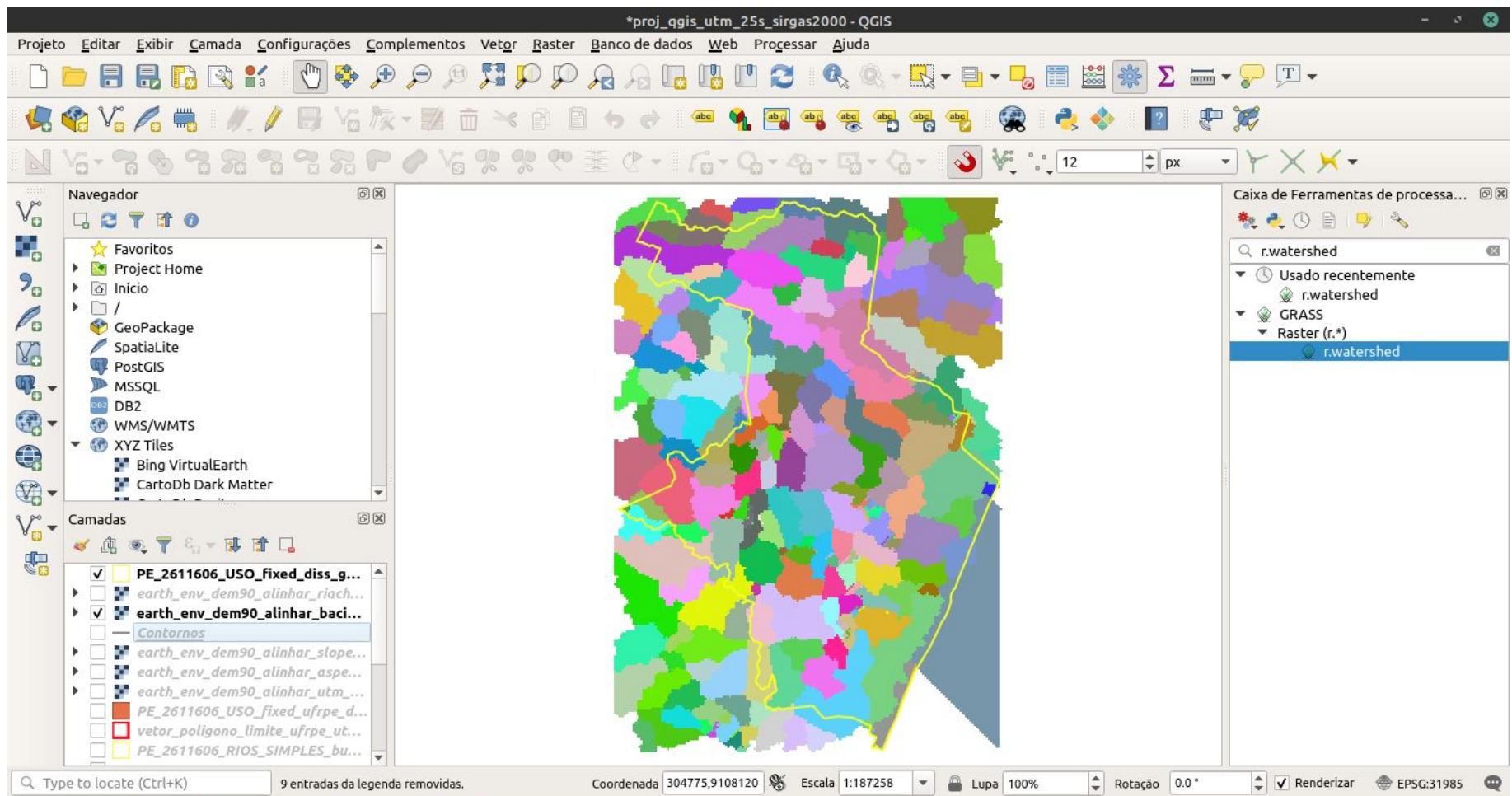
Minimum size of exterior watershed basin: 100

Unique label for each watershed basin

Stream segments

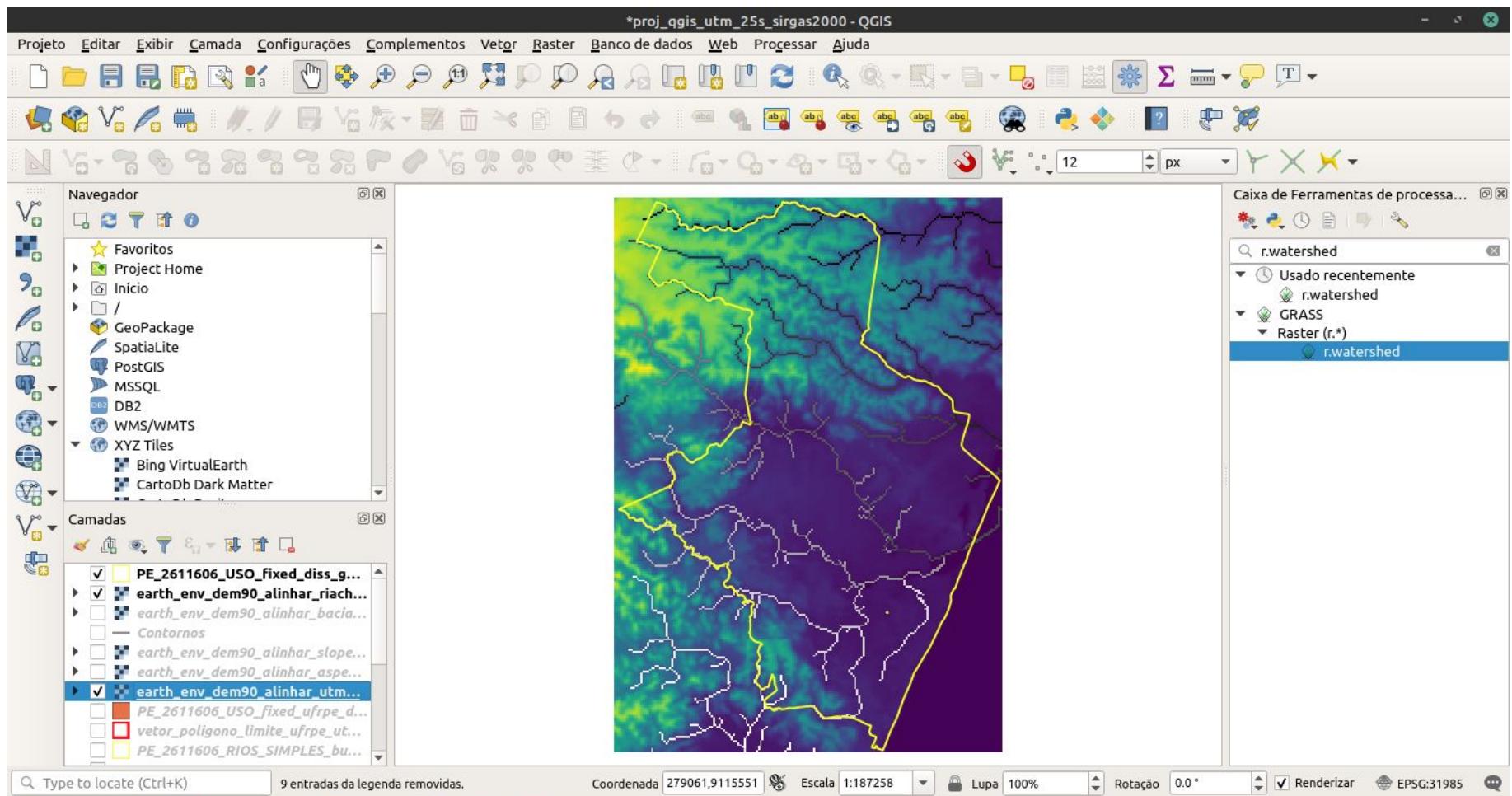
# 7.20 Topografia

## Bacia hidrográfica e rios (r.watershed)



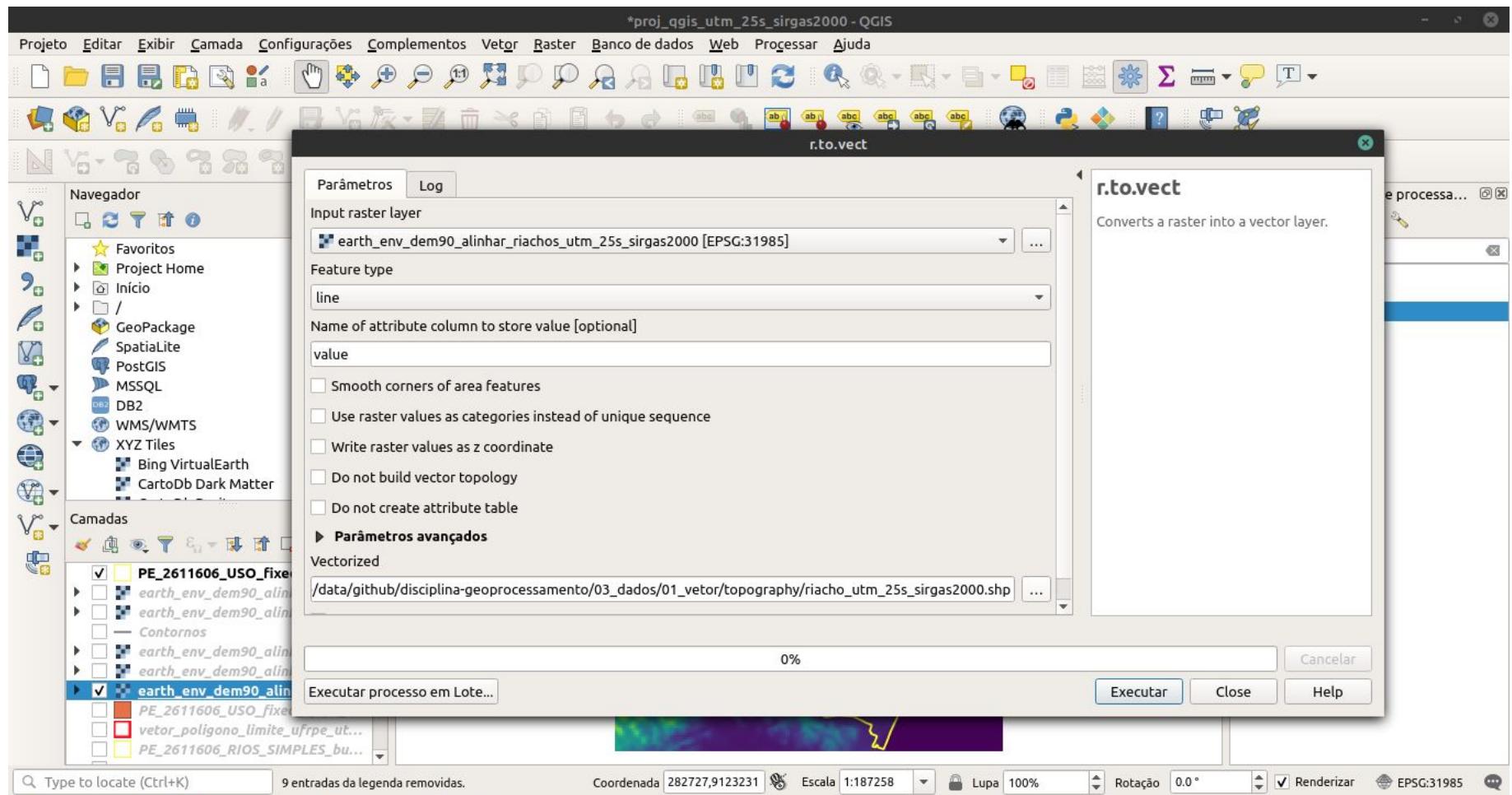
# 7.20 Topografia

## Bacia hidrográfica e rios (r.watershed)



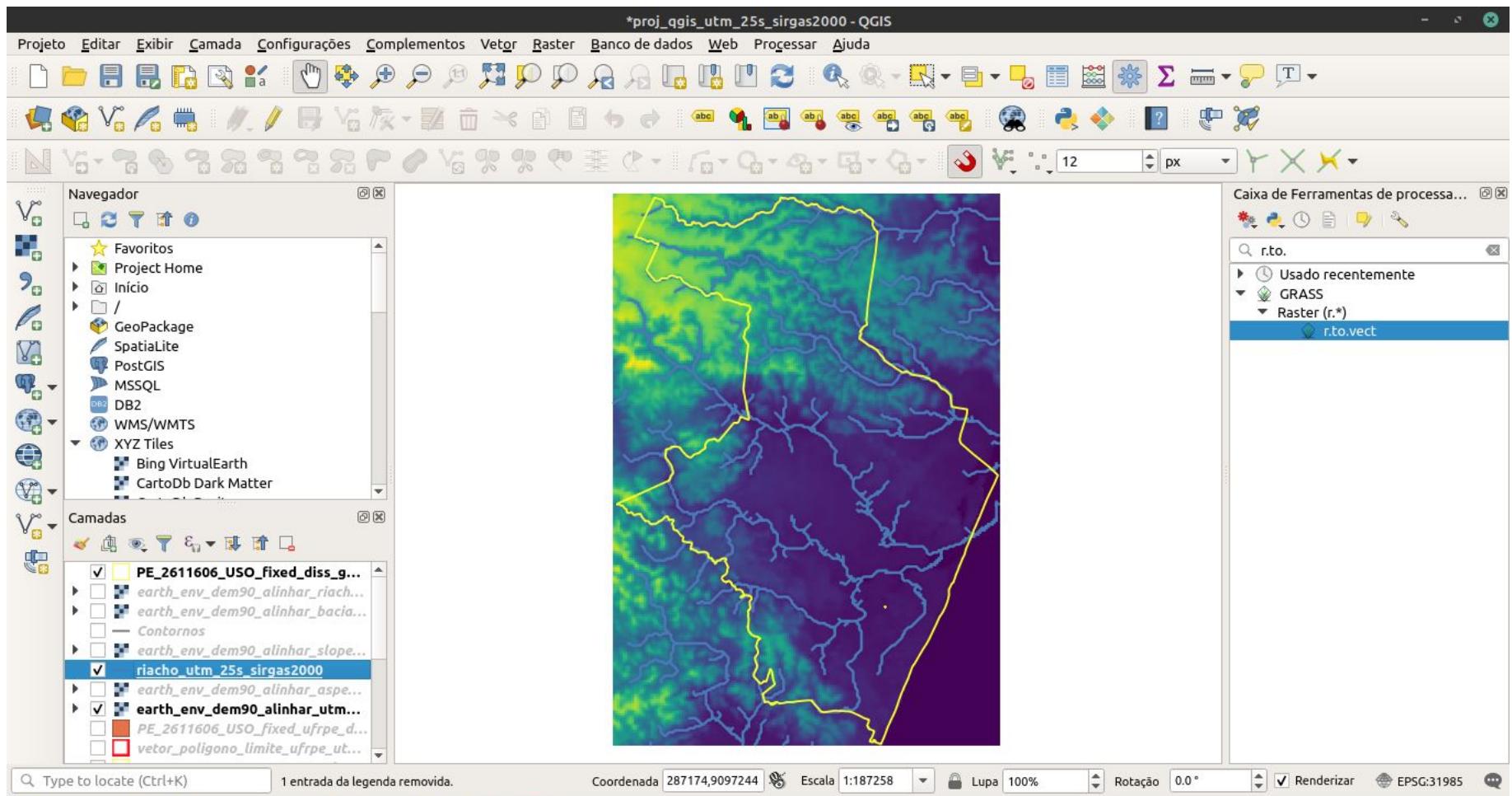
# 7.21 Conversão de vetor e raster

## Raster para linhas (r.to.vect)



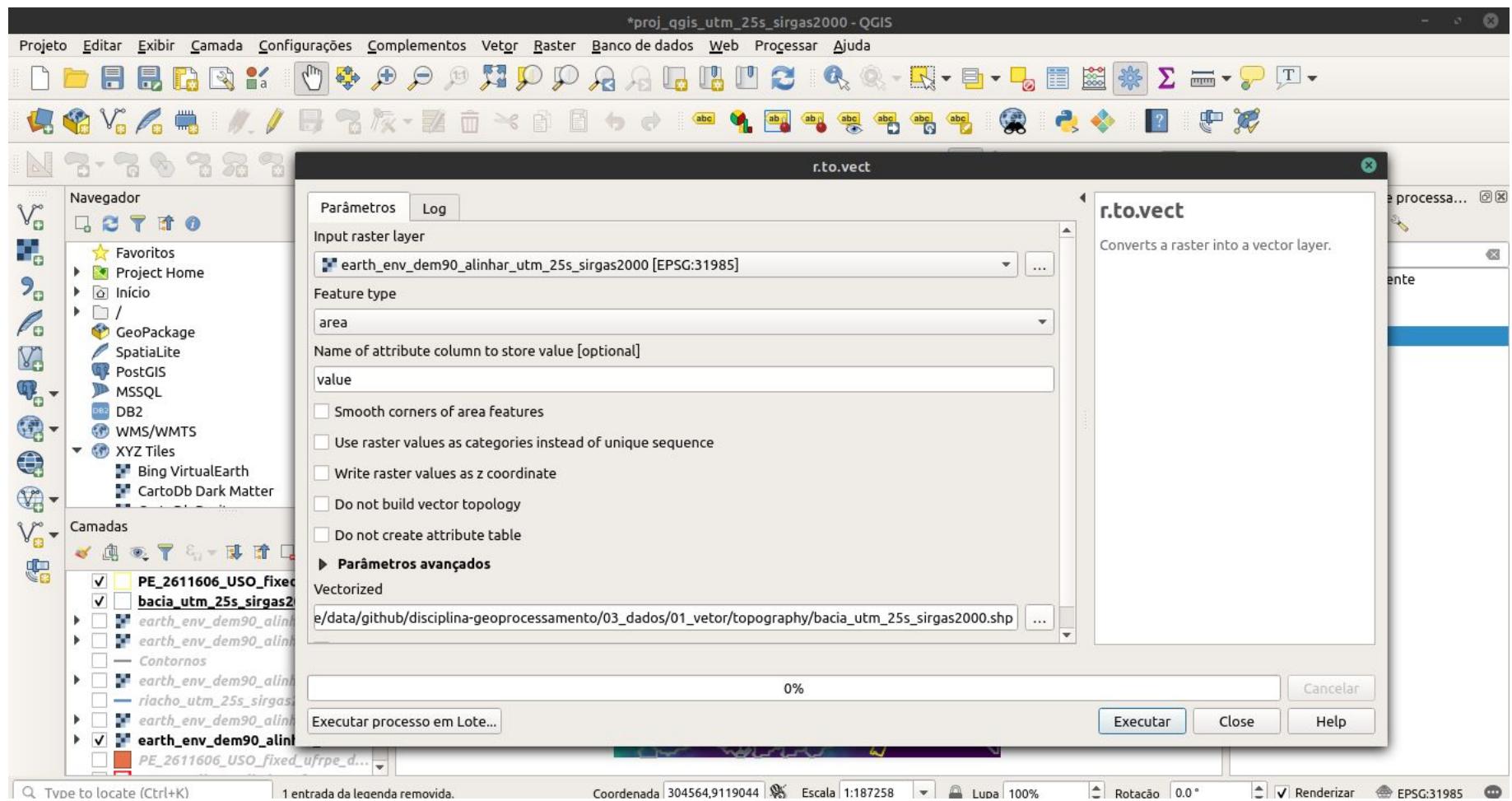
# 7.21 Conversão de vetor e raster

## Raster para linhas (r.to.vect)



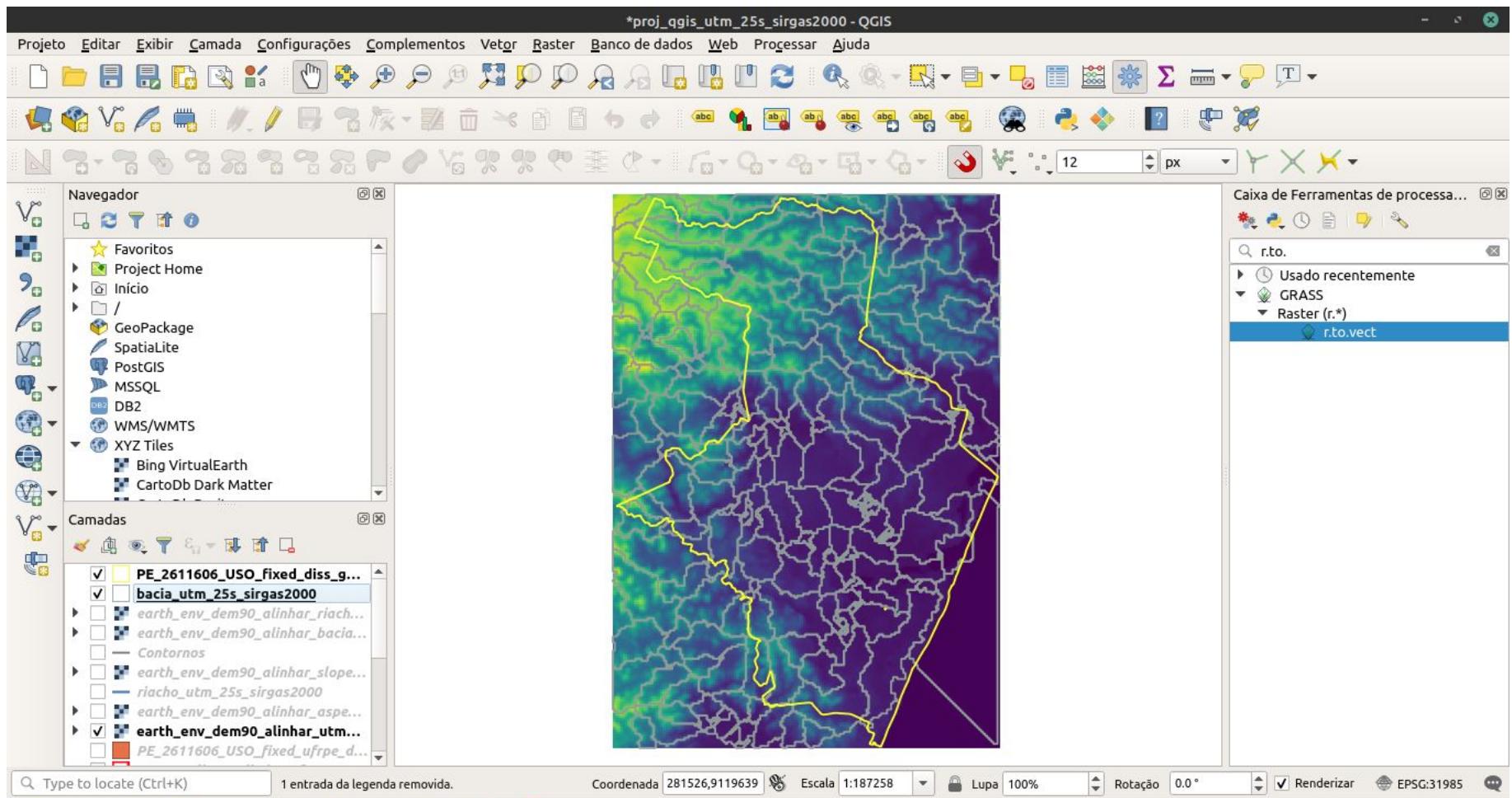
# 7.21 Conversão de vetor e raster

## Raster para polígonos



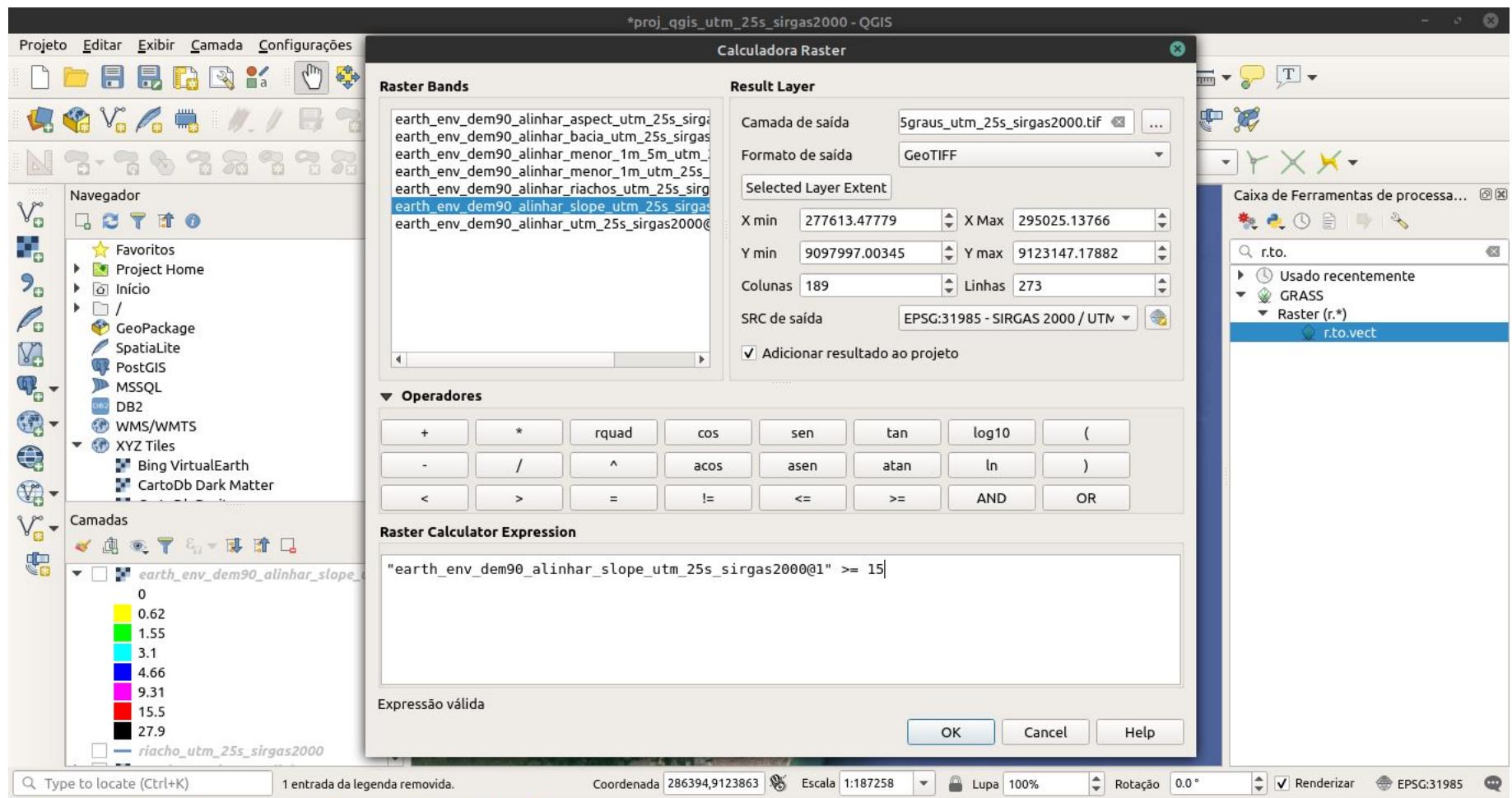
# 7.21 Conversão de vetor e raster

## Raster para polígonos



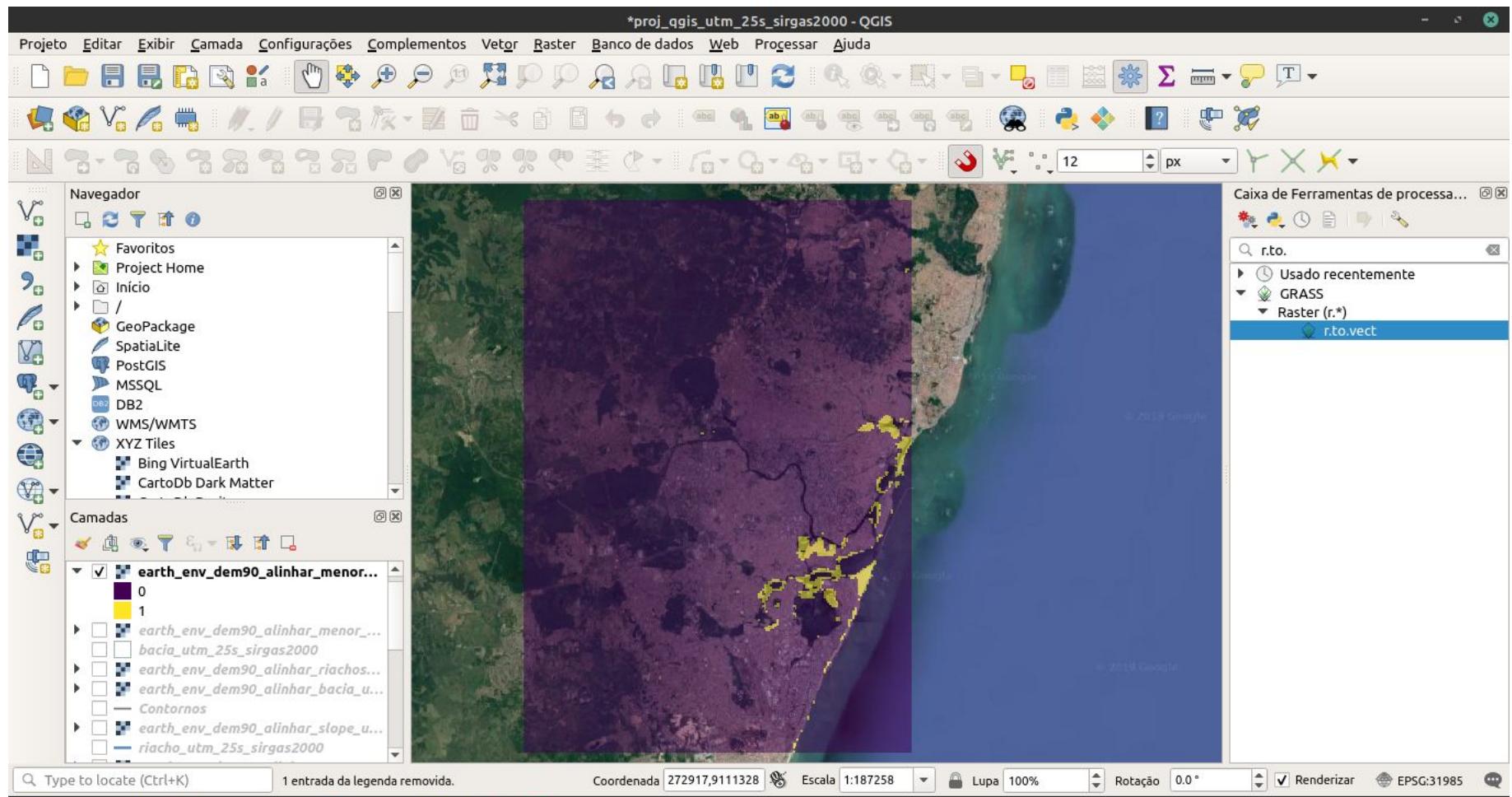
# 7.22 Calculadora raster

## Operações nos pixels



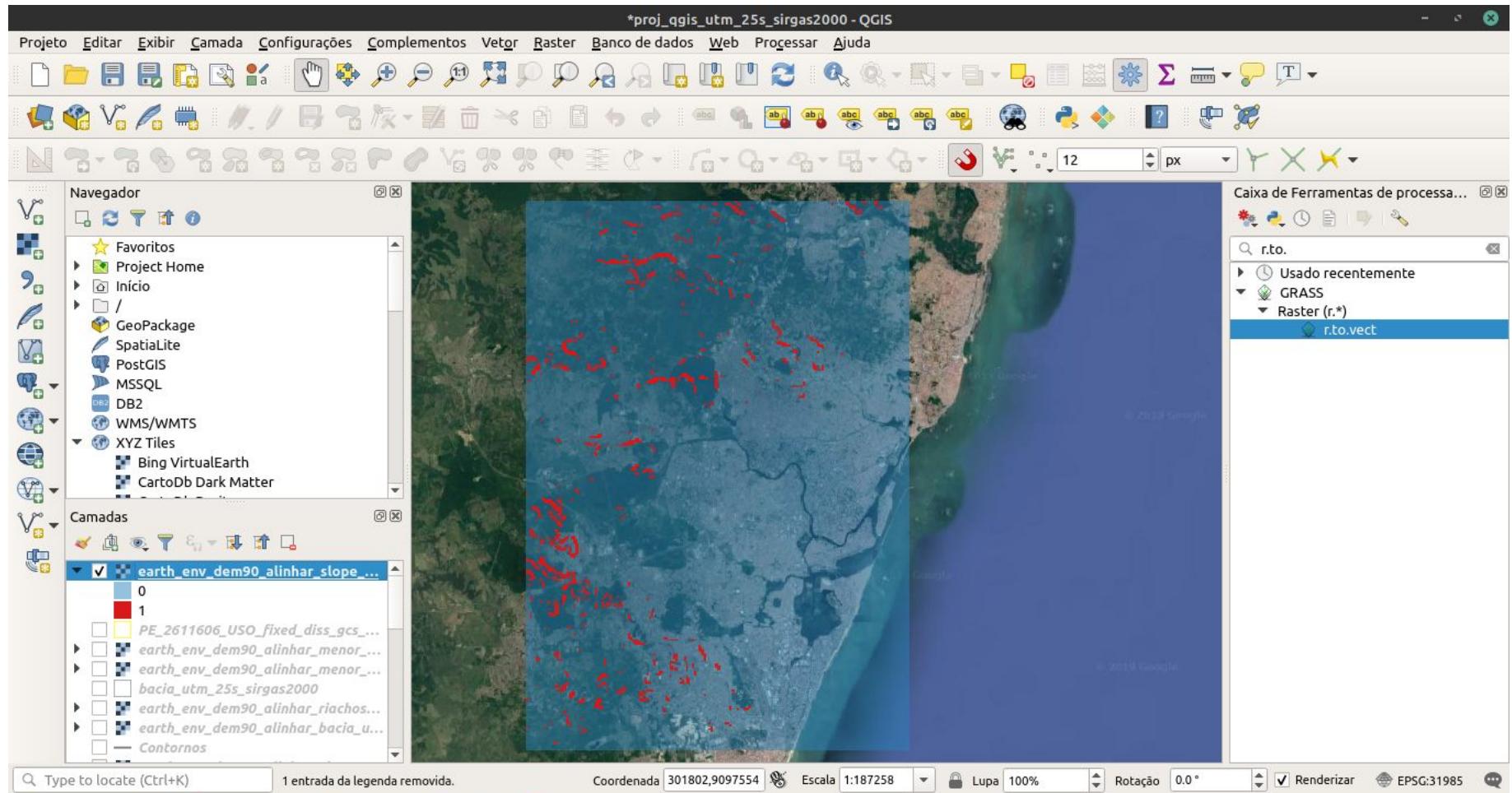
## 7.22 Calculadora raster

Elev >= 1 AND Elev <= 5



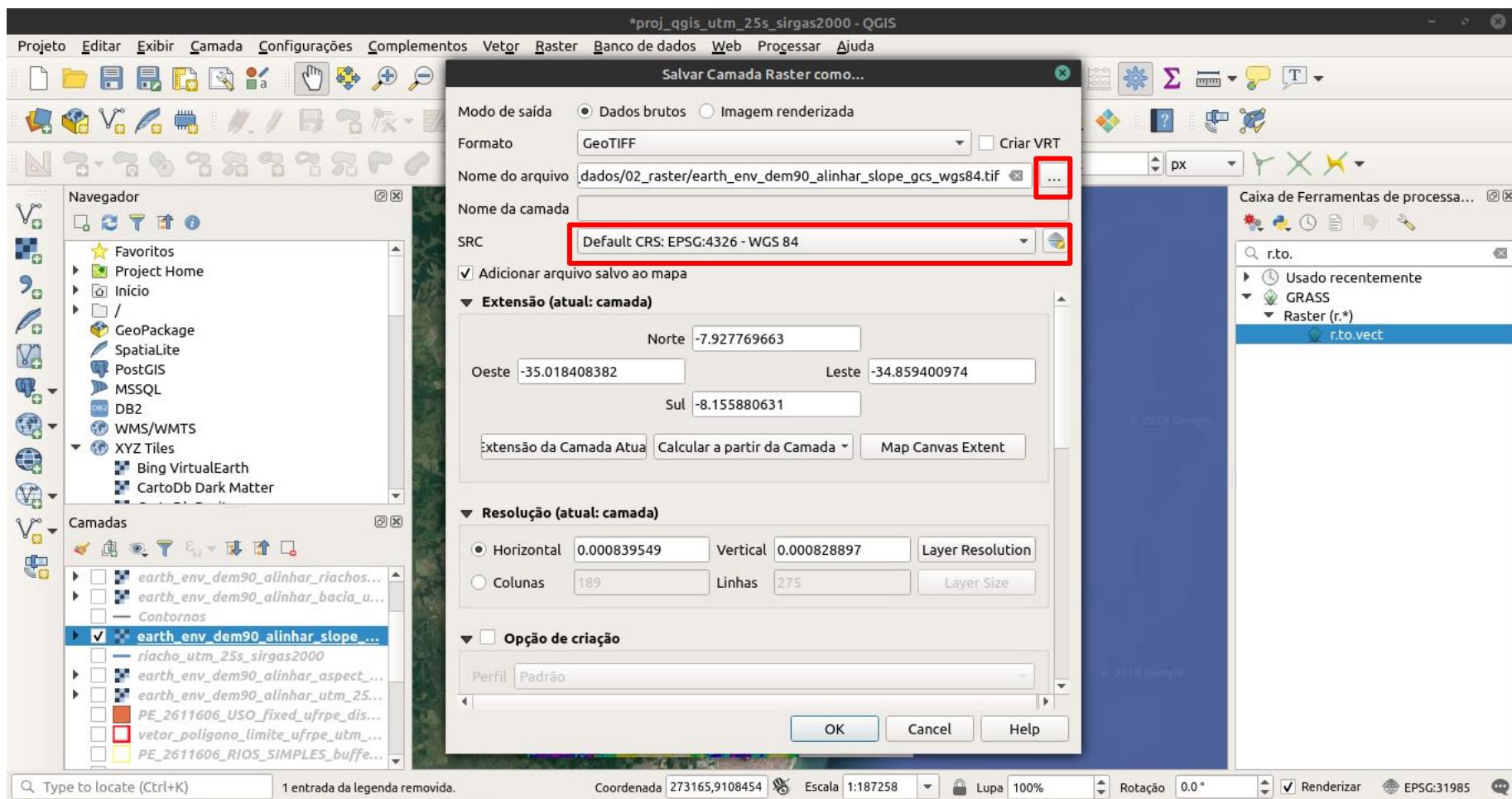
## 7.22 Calculadora raster

Slope  $\geq 15$



## 7.23 Reprojetar e exportar dados matriciais

Exportar earth\_env\_dem90\_alinhar\_slope\_utm\_25s\_sirgas2000 com coordenadas geográficas e Datum WGS 84



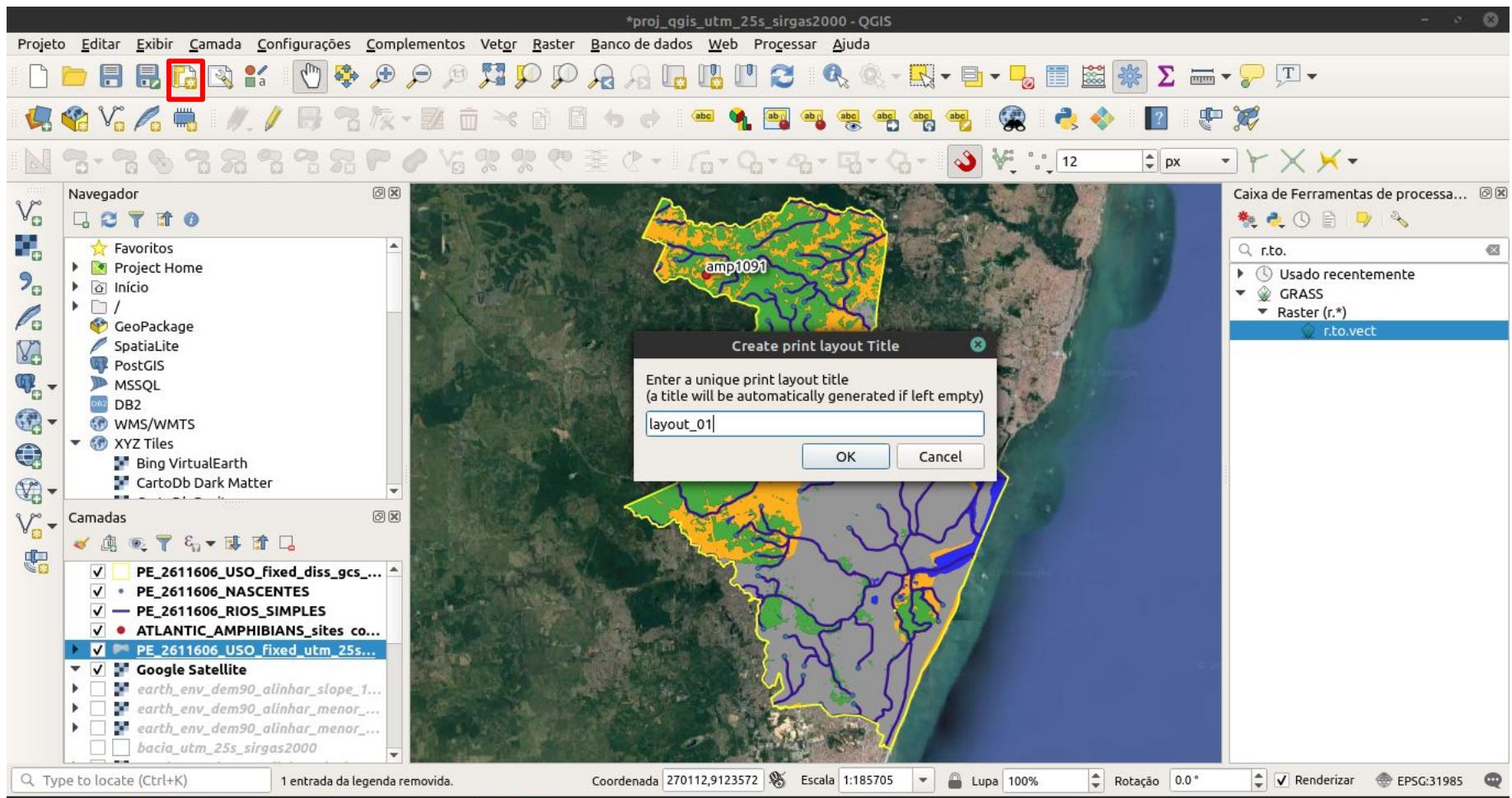
# 7.24 Elaboração de mapa temáticos

## Elementos de um mapa



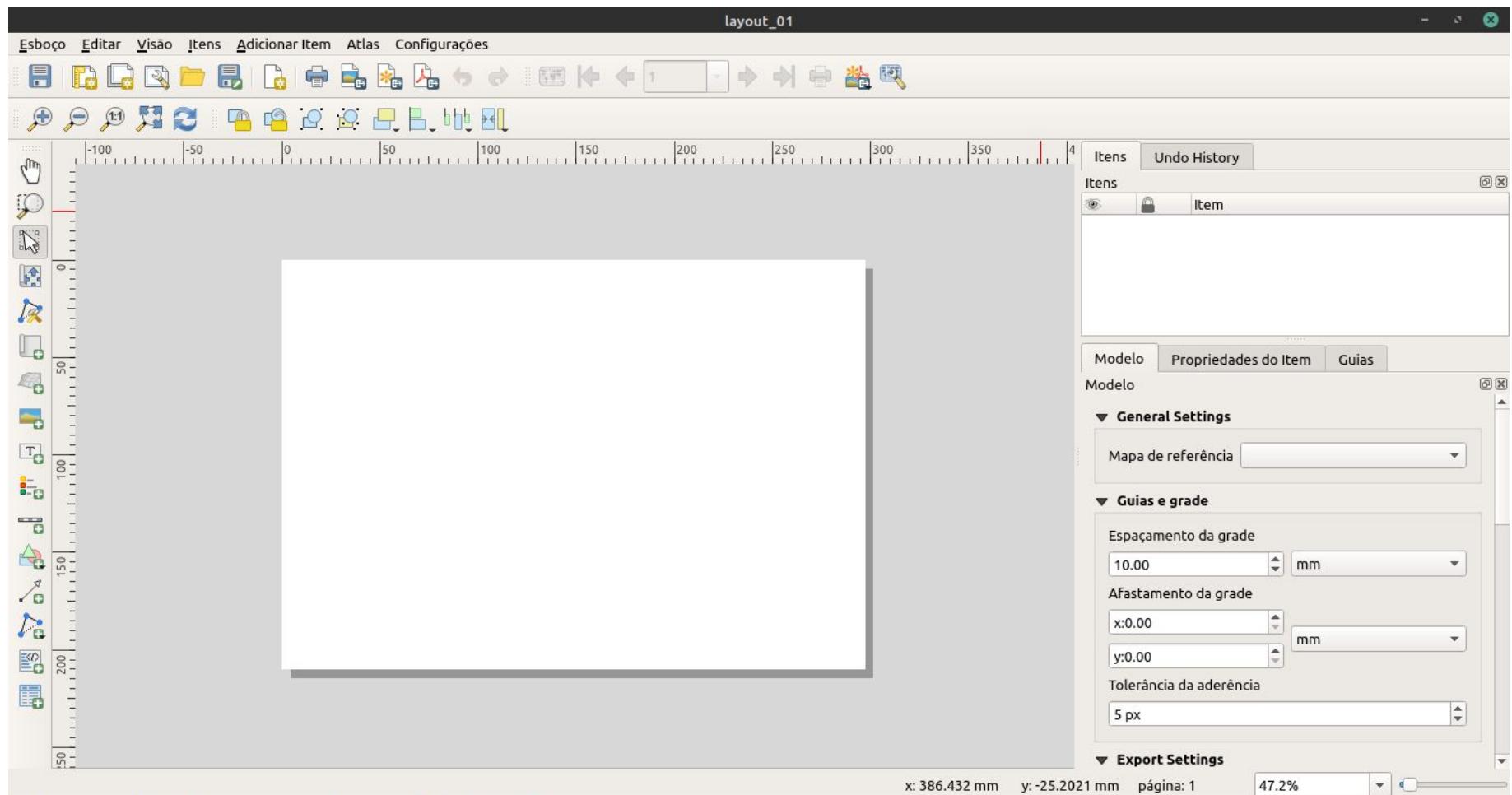
# 7.24 Elaboração de mapa temáticos

## Layout



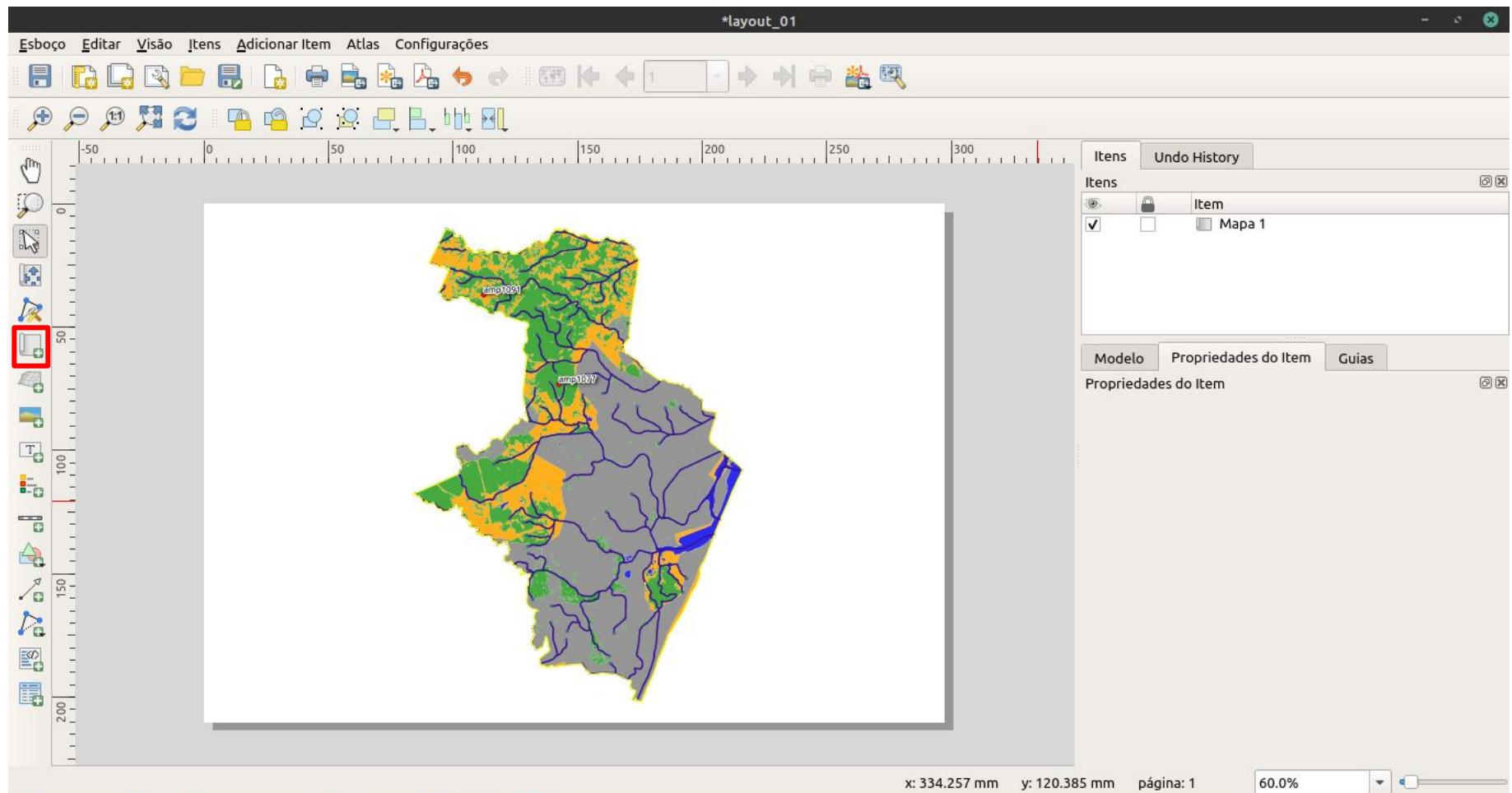
# 7.24 Elaboração de mapa temáticos

## Layout



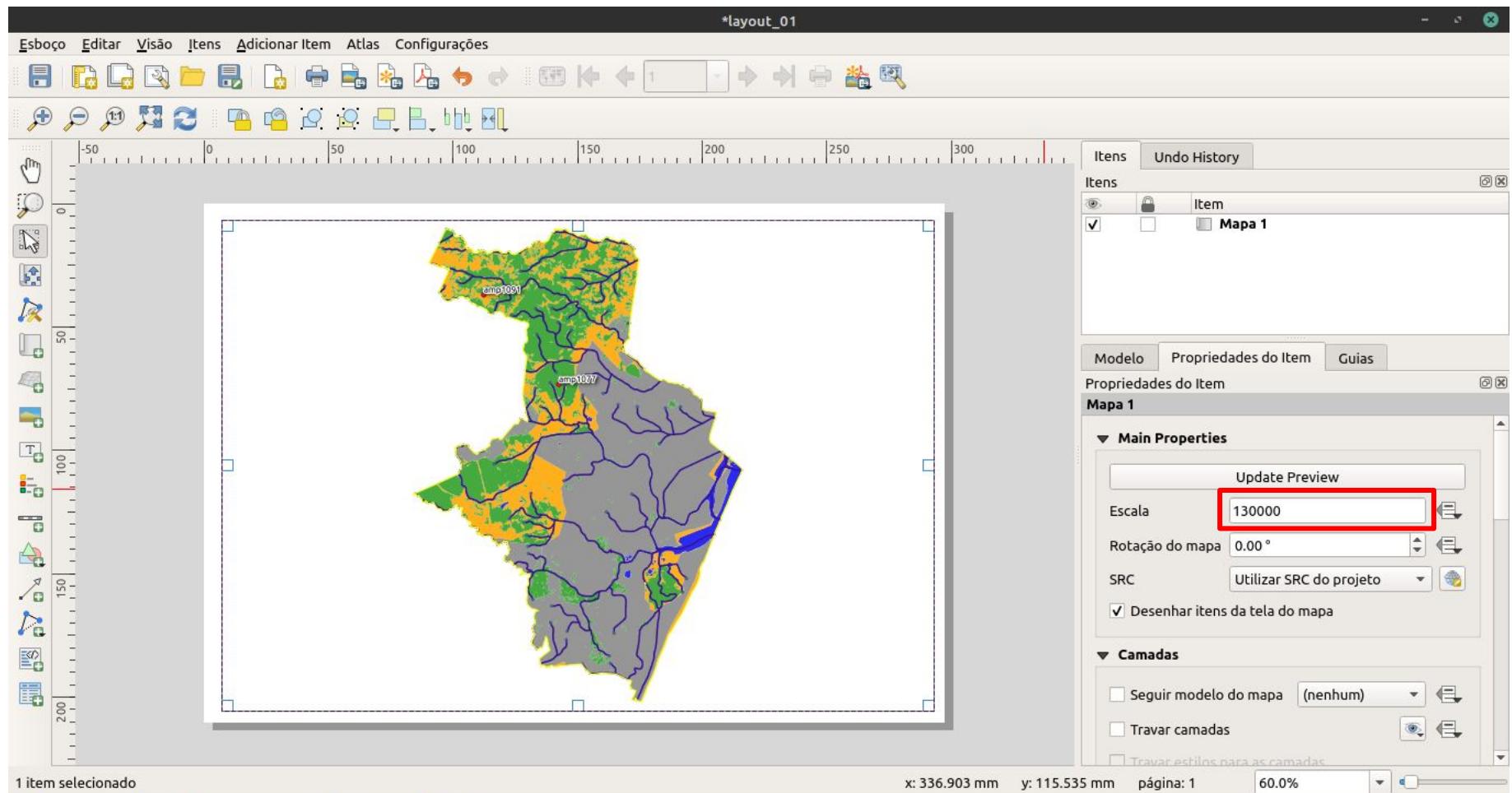
## 7.24 Elaboração de mapa temáticos

Adds a new map to the layout



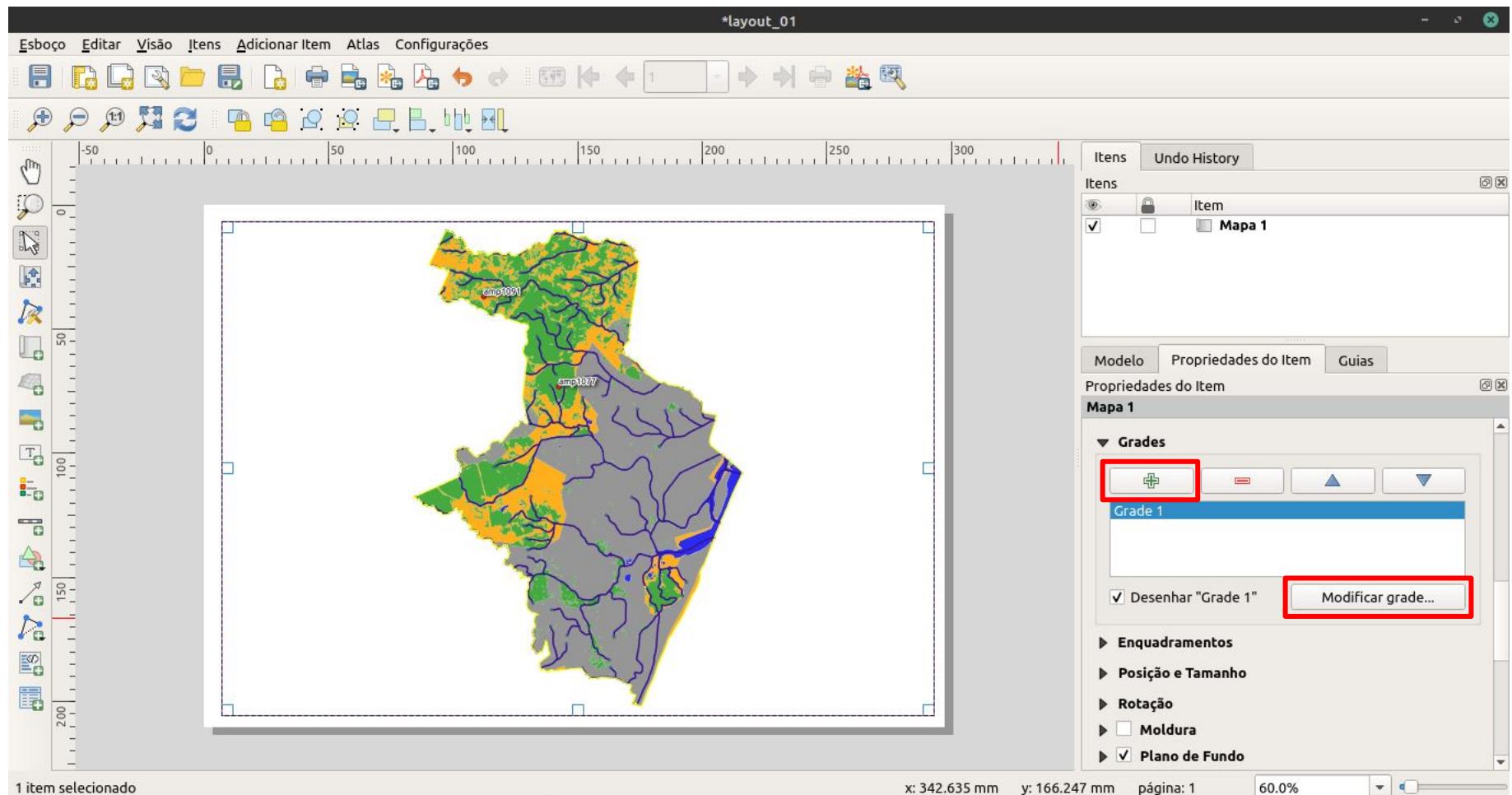
# 7.24 Elaboração de mapa temáticos

Escala - 130.000



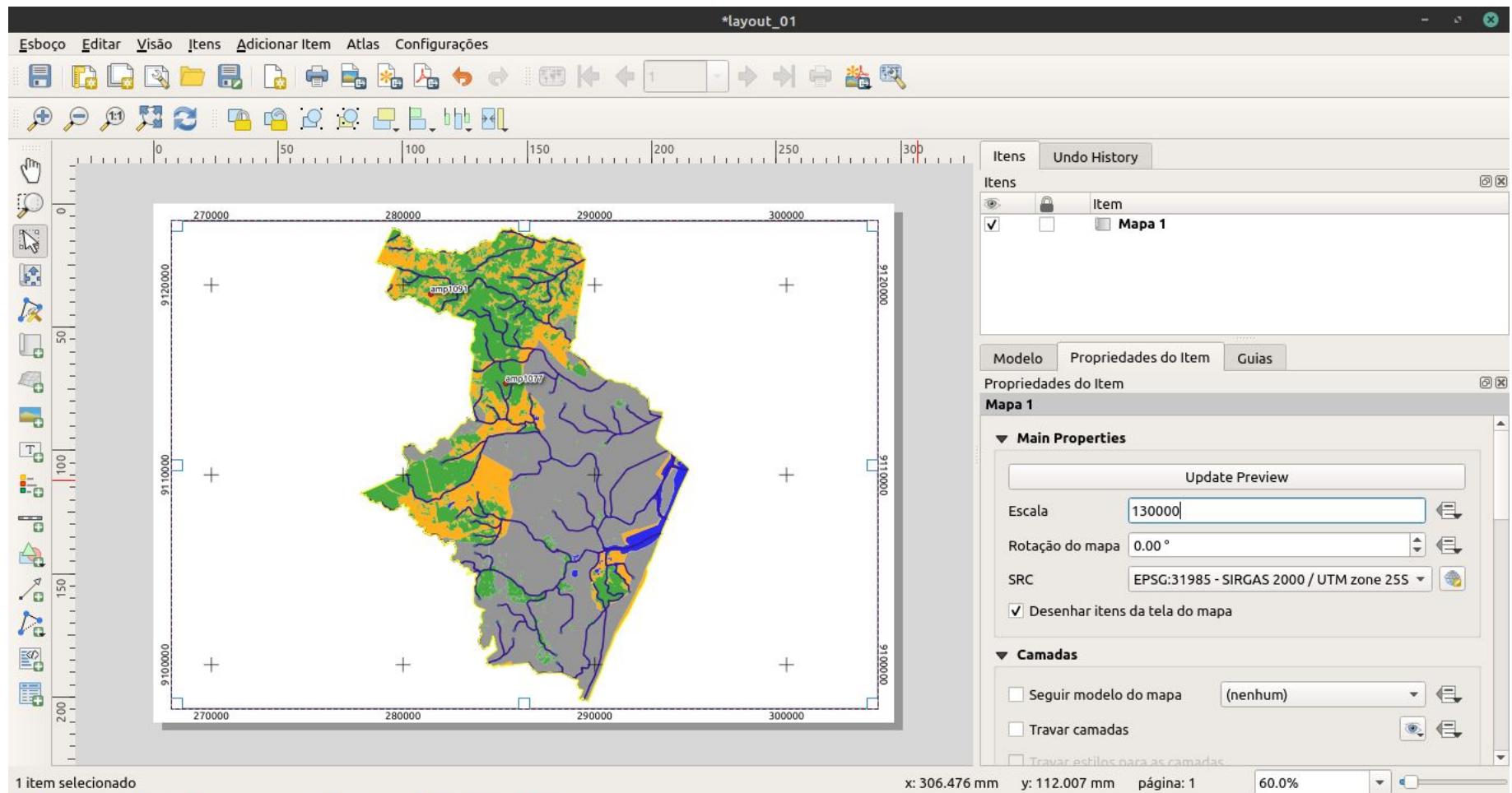
# 7.24 Elaboração de mapa temáticos

## Gride



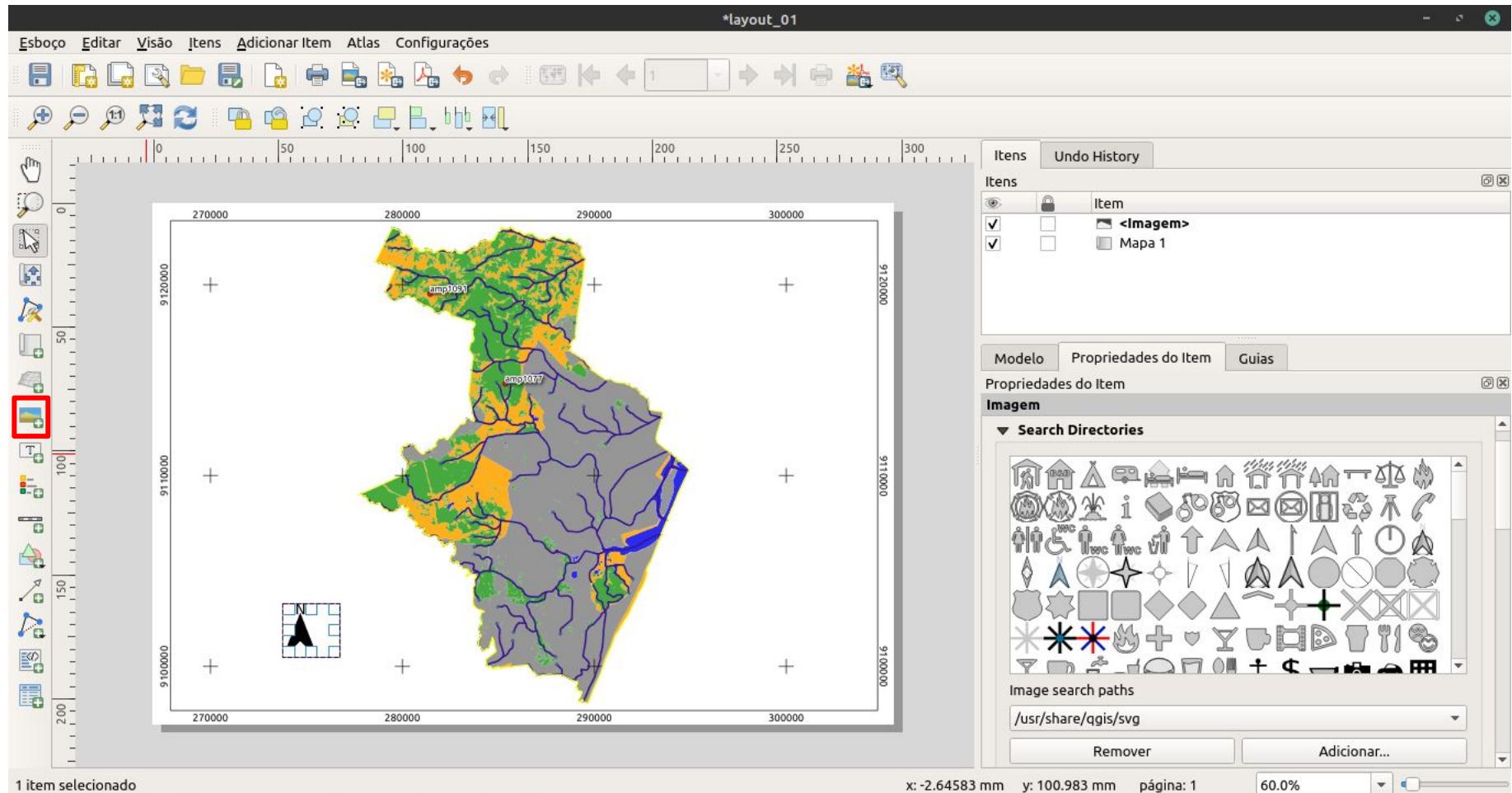
# 7.24 Elaboração de mapa temáticos

## Add coordenadas



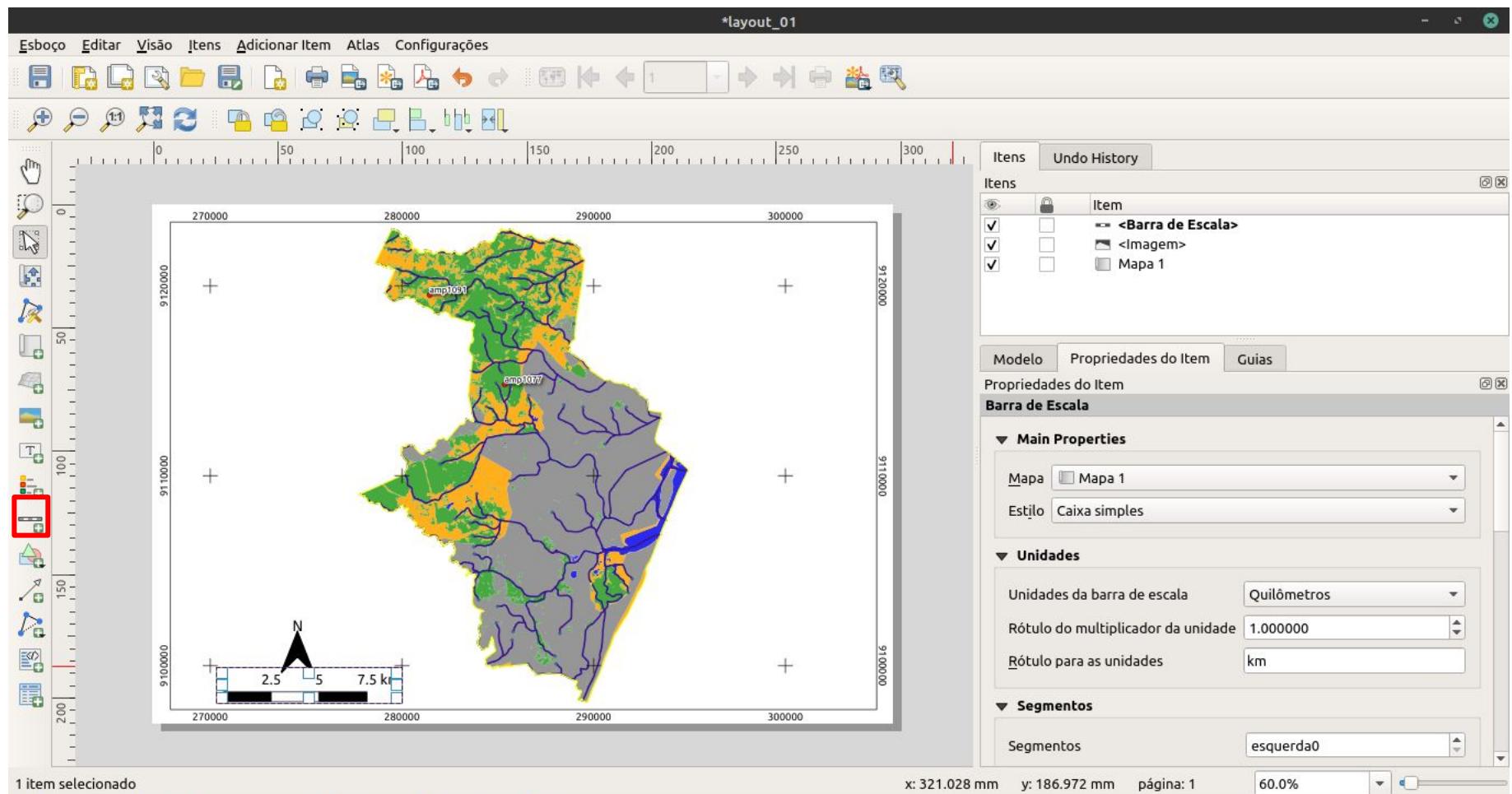
# 7.24 Elaboração de mapa temáticos

Norte



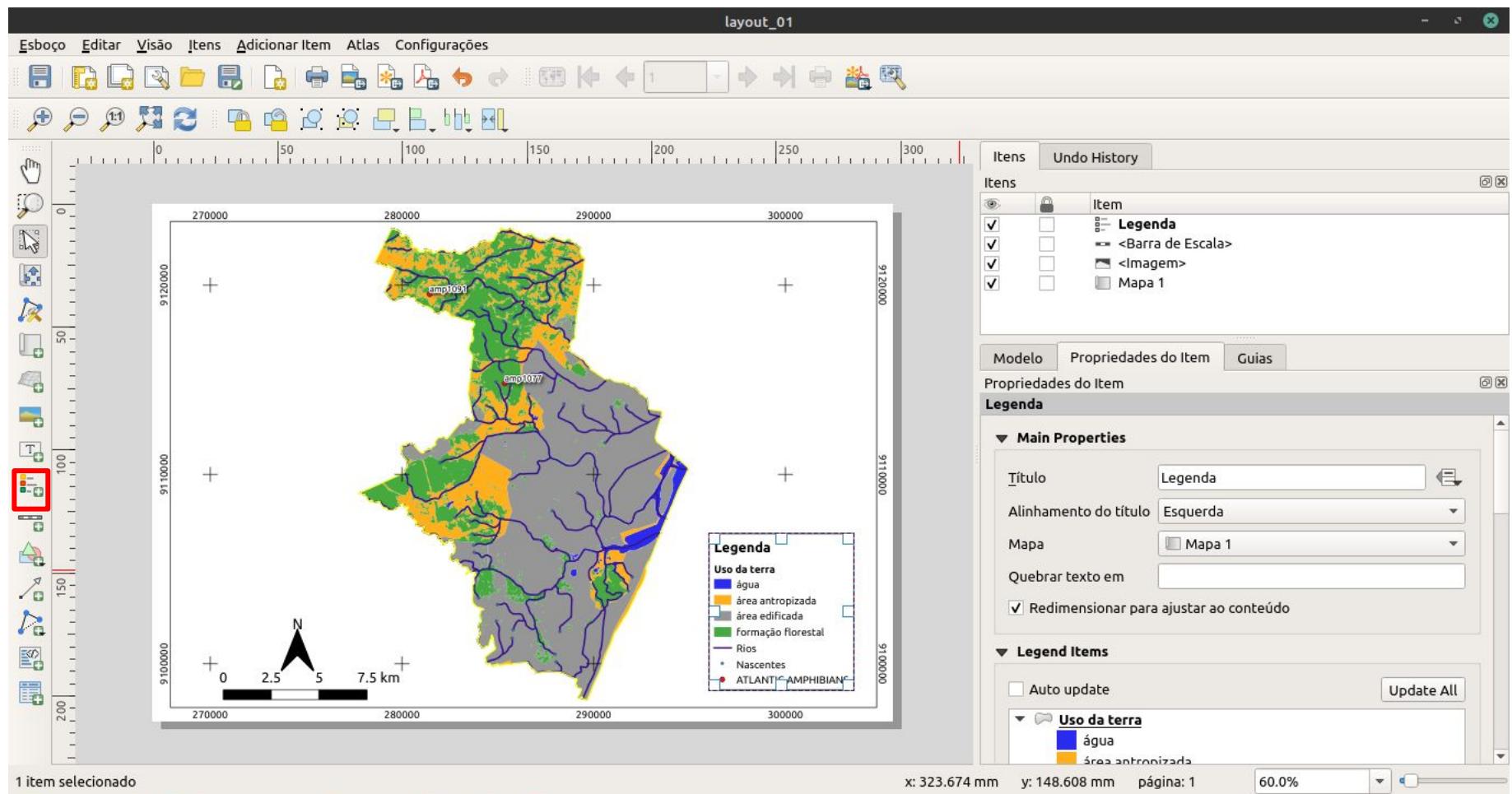
# 7.24 Elaboração de mapa temáticos

## Escala



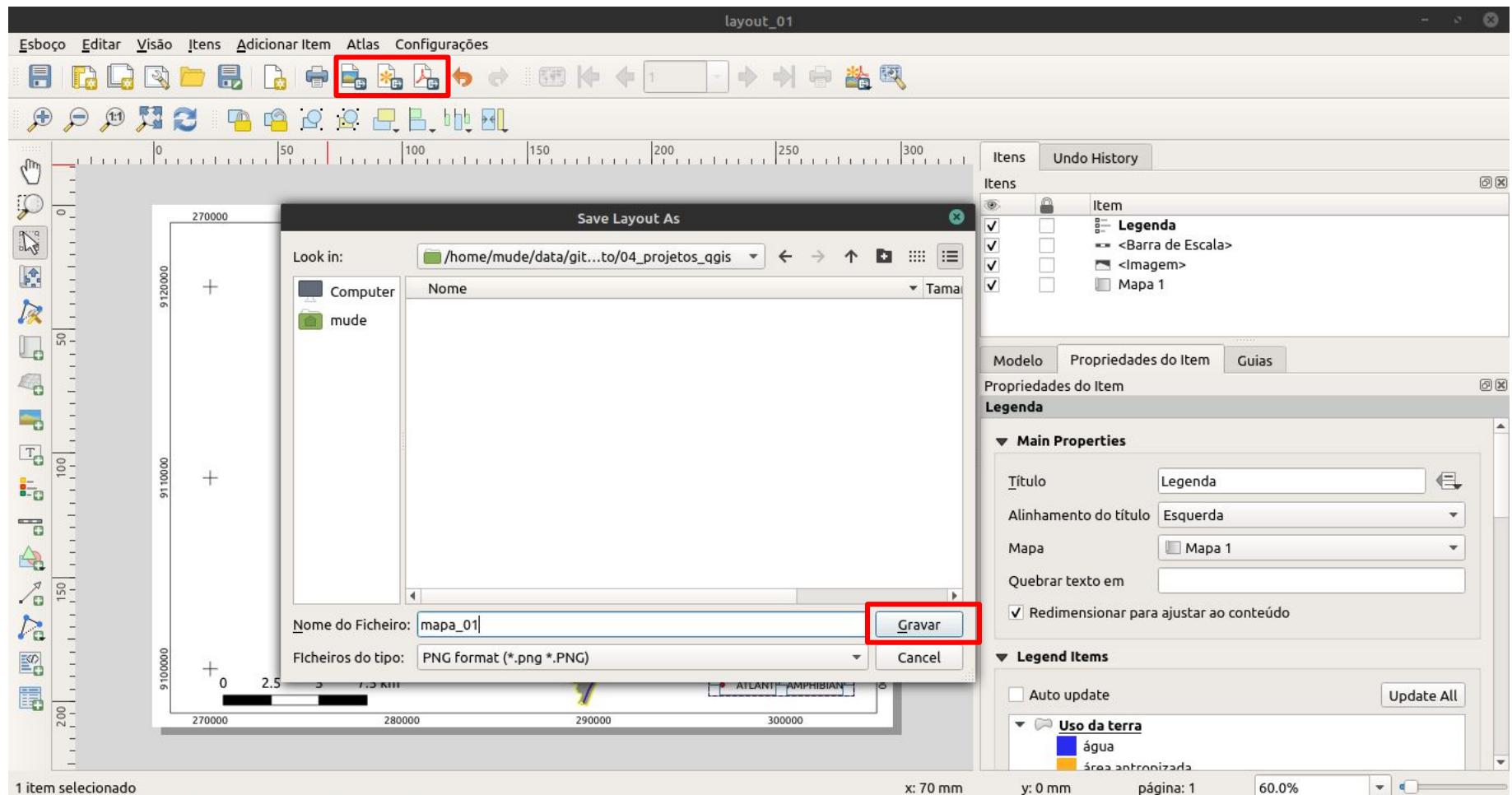
# 7.24 Elaboração de mapa temáticos

## Legenda



# 7.24 Elaboração de mapa temáticos

## Exportar



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