INTERNATIONAL TRAINING ON TOPONYMY MANUAL GUIDES

19 - 23 JUNE 2023 BALI, INDONESIA





MANUAL GUIDE Data Processing & Management (QGIS, PostgreSQL, PostGIS)

3.1 Introduction

The general flow of processing and managing Training Data in PostgreSQL is depicted in the following flowchart:



The collected geographical names data, obtained through surveying tools, undergoes extraction into spatial formats such as GeoJSON or Shapefile to facilitate subsequent data processing and management. During this training, the primary tool employed for processing geographical names data is GIS software, particularly QGIS. Data management is carried out using PostgreSQL, a Database Management System (DBMS), which is enhanced by the spatial capabilities offered by the PostGIS extension. To streamline the migration of geographical feature data into the database, the *Save to PostGIS plugin* is utilized within QGIS.

The spatial data, in the form of geographical names, is imported into QGIS to undergo processing with the principal aim of ensuring compatibility with the PostgreSQL geographical names database format. This includes consistent column naming and attribute completion. Upon successful formatting, the geographical names data is inserted into the database using the *Save to PostGIS plugin*, developed by BIG. This plugin empowers users to insert data into pre-existing tables specifically designed within the PostgreSQL. Data management is performed utilizing a Database Management System (DBMS), taking into account various factors including data accessibility to enable access by multiple users, data security involving



authorization, data administration and management encompassing tasks such as backup, restoration, and data optimization, and supporting scalability.

The geographical names data stored within the database can be accessed by multiple users for a variety of purposes, including processing and presentation. Users have the option to utilize GIS applications such as QGIS and Openjump, GIS servers such as Geoserver, or develop their own web-based or desktop applications. In this training, the stored data is additionally presented in the form of a gazetteer utilizing the *Gazetteer Creator plugin* in QGIS and *Gazetteer Creator* (standalone desktop application). This plugin and application facilitates data retrieval from the database and enables the generation of a gazetteer in PDF format, specifically designed for printing purposes.

The steps of the Data Processing and Management workflows are :

- Database Creation Create Database using PostgreSQL
- Table Creation Create Geographical Names Table based on design
- Data Processing Ensuring compatibility with the PostgreSQL geographical names database format, including consistent column naming and attribute completion
- Save to PostGIS Migrating data to Geographical Names Table using Save to PostGIS plugin

3.2 Installment

1. PostgreSQL

The installation procedure for the PostgreSQL server on a Windows operating system entails the following general steps:

- 1. Visit the official PostgreSQL website at https://www.postgresql.org/download
- 2. Proceed to download the appropriate installation file from the provided link.

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	25th May 2023: <u>PostgreSQL 16 Beta 1 Released</u> !			
Quick Links	Downloads 🛓			
Downloads Packages Source Source Software Catalogue File Browser	PostgreSQL Downloads			
	PostgreSQL is available for download as ready-to-use packages or installers for various platforms, as well as a source code archive if you want to build it yourself.			
	Packages and Installers			
	Select your operating system family:			
	Linux macOS Windows BSD Solaris			
	Source code			
	The source code can be found in the main file browser or you can access the source control repository directly at glt.postgresql.org. Instructions for building from source of	can be found in the docu	umentatio	on.
	Beta/RC Releases and development snapshots (unstable)			
	There are source code and binary packages of beta and release candidates, and of the current development code available for testing and evaluation of new features. Note testing purposes only, and not for production systems.	e that these builds should	ld be used	i for
	3rd party distributions			
	Ready to run stacks			



Home About Downloa	ad Documentation Community Developers Suppor	t Donate Your account				Search for	Q
		25th May 2023: Postgr	eSQL 16 Beta 1 Released!				
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ownloads Packages	Interactive installer by ED	В					
Source	Download the installer certified by EDB for	r all supported PostgreSOL versions					
oftware Catalogue ile Browser	Note! This installer is hosted by EDB and r		ers. If you have issues with th	e website it's hosted on, p	lease contact webmaster@ente	rprisedb.com.	
	This installer includes the PostgreSQL serv	er, pgAdmin; a graphical tool for mana	ging and developing your dat	abases, and StackBuilder; a	a package manager that can be		all additio
	PostgreSQL tools and drivers. Stackbuilder		gration, replication, geospatia	il, connectors and other to	ools.		
	This installer can run in graphical or silent The installer is designed to be a straightfor		ith PostgreSQL on Windows.				
	Advanced users can also download a zip a			d for users who wish to in	nclude PostgreSQL as part of and	other application installer.	
	Platform support						
	The installers are tested by EDB on the foll					ows:	
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	15	2019, 2016					
	14	2019, 2016					
	13	2019, 2016					
	12	2019, 2016, 2012 R2					
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- 3. Run the installation file: Double-click on the downloaded file to start the installation process. If a security warning appears, click "Run" or "Yes" to proceed
- 4. Click **Next** button

		_		×
PACKAGED BY	Setup - PostgreSQL			
😶 EDB	Welcome to the PostgreSQL Setup Wizard.			
(F)				
PostgreSQL				
	< Back Ne	ext >	Can	cel





5. Set up the folder installation and click **Next** button

💕 Setup	_		×
Installation Directory			
Please specify the directory where PostgreSQL will be installed. Installation Directory C:\Program Files\PostgreSQL\15			
VMware InstallBuilder			
< Back	Next >	Cancel	

- 6. Select software component to install :
 - a. The PostgreSQL Server to install the PostgreSQL database server
 - b. pgAdmin 4 to install the PostgreSQL database GUI management tool.
 - c. Command Line Tools to install command-line tools such as psql, pg_restore, etc. These tools allow you to interact with the PostgreSQL database server using the command-line interface.
 - d. Stack Builder provides a GUI that allows you to download and install drivers that work with PostgreSQL.



7. Select the database directory to store the data



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Data Directory				
Please select a directory under which to store your data. Data Directory :\Program Files\PostgreSQL\15\data	60			
VMware InstallBuilder				
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Set up password and click Next

<table-of-contents> Setup</table-of-contents>	_		×
Password			
Please provide a password for the database superuser (postgres).			
Retype password			
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8. Set up the application port and click Next and wait until the installation finish

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Cancel



VMware InstallBuilder



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VMware InstallBuilder			
< Back Ne	ext >	Can	cel

💕 Setup	_		
Ready to Install			
Setup is now ready to begin installing PostgreSQL on your computer.			
VMware InstallBuilder Kennel State S	Next >	Cancel	

To install PostgreSQL on another operating system, please visit <u>https://www.postgresql.org/docs/</u> to access the detail instructions based on your operating system.



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		25th May 2023: <u>PostgreSQL 16 Beta 1 Released</u> !	
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Books Tutorials & Other Resources	Manuals 🗐 👘		- 103300
FAQ Wiki	You can view the manual for an	older version or download a PDF of a manual from the below table.	
	Online Version	PDF Version	
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	15 / Current	A4 PDF (13.6 MB) • US PDF (13.4 MB)	
	14	A4 PDF (13.3 MB) • US PDF (13.2 MB)	
	13	A4 PDF (13.0 MB) • US PDF (12.9 MB)	
	12	A4 PDF (12.7 MB) • US PDF (12.6 MB)	
	11	A4 PDF (12.4 MB) • US PDF (12.3 MB)	
	Development snapshot	PDF version not available	

2. PostGIS

The installation procedure for the PostGIS extension on a Windows operating system entails the following general steps:

1. Visit <u>https://download.osgeo.org/postgis/windows/</u> and select the version that is compatible with your postgresql server version.

ile Name ↓	File Size 4	Date 1
arent directory/	-	-
<u>xtras/</u>	-	2014-Jan-16 05:49
<u>g10/</u>	-	2022-Aug-21 03:35
<u>g11/</u>	-	2023-Jun-02 15:53
<u>g12/</u>	-	2023-Jun-02 05:54
<u>913/</u>	-	2023-Jun-02 04:45
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9 <u>80/</u>	-	2012-Oct-31 17:38
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984/	-	2013-Mar-16 05:00
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<u>991/</u>	-	2014-May-18 19:15
9 <u>92/</u>	-	2015-Aug-16 04:28
993/	-	2016-Oct-16 06:38
9 <u>94/</u>	-	2018-Dec-10 00:02
995/	-	2018-Dec-09 01:17
<u>996/</u>	-	2022-Aug-21 03:34
source/	-	2022-Nov-22 02:47

← → C 🔒 download.osgeo.org/postgis/windows/pg15/

Index of /postgis/windows/pg15/

File Name ↓	File Size 4	Date 1
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archive/	-	2023-Jun-02 04:41
postgis-bundle-pg15-3.3.3x64.zip	130.5 MiB	2023-Jun-01 18:53
postgis-bundle-pg15-3.3.3x64.zip.md5	67 B	2023-Jun-02 02:32
postgis-bundle-pg15x64-setup-3.3.3-1.exe	115.2 MiB	2023-Jun-02 02:58
postgis-bundle-pg15x64-setup-3.3.3-1.exe.md5	75 B	2023-Jun-02 02:59



2. Run the installation file and click *I Agree*



3. Select component to install > PostGIS and click Next

Restored and the second	– 🗆 X
Choose Components Choose which features of PostGIS x64 15 you want to install.	Bundle 3.3.2 for PostgreSQL
Check the components you want to install and uncheck the components install. Click Next to continue.	oonents you don't want to
Select components to install: PostGIS	Description Position your mouse over a component to see its description,
Space required: 199.3 MB	
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4. Set the destination folder, click Next and wait until the installation finishes.

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Choose the folder	r in which to inst	all PostGIS Bund	le 3.3.2 for	
PostgreSQL x64	15.			
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in a different folder, click Browse and select and	other folder. Cli	ck Next to contin	ue.	
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C:\Program Files\PostgreSQL\15\		Bro	wse	
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3. Quantum GIS (QGIS)

The installation procedure for the PostgreSQL server on a Windows operating system entails the following general steps:

- 1. Download the QGIS software from this link.
- 2. After you downloaded it, double click on the QGIS installation. Then the computer will compute your space requirements → click Next.





3. The next dialog is license overview \rightarrow after you read it click accept the License Agreement box \rightarrow Next.

QGIS 3.28.3 'Firenze' Setup —		×
End-User License Agreement Please read the following license agreement carefully	(G
License overview: 1. QGIS 2. SZIP compression library (runtime) 3. MrSID Raster Plugin for GDAL 4. ECW Raster Plugin for GDAL 5. Oracle Instant Client		
I		
Print Back Next	Can	cel

4. You can choose a custom folder path installation, the default folder path was saved in C:\Program Files.



QGIS 3.28.3 'Firenze' Setup -		×
Destination Folder Click Next to install to the default folder or click Change to choose another.	(R
Install QGIS 3.28.3 'Firenze' to:		
C:\Program Files\QGIS 3.28.3\ Change		
 ✓ Create a desktop shortcuts. ✓ Create a start menu shortcuts. 		
Back Next	Can	cel

5. Then QGIS is ready to install \rightarrow click Install \rightarrow please wait for a couple minutes until the program finished

💽 QGIS 3.28.3 'Firenze' Setup	_	
Ready to install QGIS 3.28.3 'Firenze'		G
Click Install to begin the installation. Click Back to rev installation settings. Click Cancel to exit the wizard.	iew or change any of you	r
Back	<u> ∏</u> nstall	Cancel



				1
Installin	g QGIS 3.28.3 'Firenze'			
			-	
Please wai	it while the Setup Wizard installs	QGIS 3.28.3 'Firenze	ć.	
Status:	Validating install			
status:	validaung instali			

6. QGIS has been successfully installed and we are ready to use QGIS for data processing.



4. QGIS Plugins

- 1. QuickMapServices
 - a. Open QGIS, click on the Plugins \rightarrow Manage and Install Plugins..
 - b. Select All \rightarrow search QuickMapServices plugin \rightarrow click Install Plugin.





- c. The plugin will appear in the Web menu.
- d. To add basemap services to the QGIS layer click Web \rightarrow QuickMapServices \rightarrow Search QMS \rightarrow search Bing \rightarrow click Add.

<u>W</u> eb <u>M</u> esh Pro <u>c</u> essing	9	<u>H</u> elp					
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ct Templates		۲	Set p	rope	r scal	e	
•		٩	Setti	ngs			
		4	Abou	ut QN	٨S		
		_					

- 2. Save to PostGIS
 - a. Open QGIS, click on the Plugins \rightarrow Manage and Install Plugins..
 - b. Select Install from ZIP \rightarrow browse save_to_postgis.zip file \rightarrow click Install Plugin.





c. The plugin will appear in the Plugins menu.

<u>P</u> lug	ins Vect <u>o</u> r <u>R</u> ast	er <u>D</u> atabase	<u>W</u> eb	<u>M</u> esh	HCMGIS	Pro <u>c</u> essing	
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	<u>P</u> lugin Builder			• Ē			
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s	<u>SINAR Visualizatio</u>	on		•			
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	<u>T</u> oponyms Manag	gement) 🕅	Save to F	PostGIS	
				Ŵ	Gazettee	r Creator	

3.3 Create Database

The database is created using PGAdmin, a popular software used for managing databases in PostgreSQL. PGAdmin provides features that enable users to perform tasks such as creating, editing, and deleting tables, managing users and access permissions, executing SQL queries, as well as viewing and analyzing data within the PostgreSQL database. The details procedure in creating a database is explained as follows:



1. Launch pgAdmin



2. Connect to a PostgreSQL server

In the pgAdmin interface, expand the "Servers" group in the left sidebar. Locate and select the PostgreSQL server you want to work with. Enter your server credentials if prompted.

pgAdmin 4	× +	-				
← C (i) 127.0	.0.1:11900/browser/					
File V Object	🗸 Tools 🗸 Help 🗸					
Browser	4	T Dashboard	Properties	SQL Statistics	Dependencies	Dependents
🗸 🗮 Servers (14)						
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Connect to Se	rver					
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12"					_	
Password						
	·					
	Save Password					
				× Cancel	🗸 ОК	

3. Create a new database

Right-click on the selected server and choose "Create" from the context menu. Then, select "Database" from the submenu.

Pg Admin	File 🗸	Object 🗸	Tools 🗸	Hel	p 🗸		
Browser					۶ 🔳 🔻	Dashboard	Properties
 Servers (14) BB_Cloning PostgreSQ Databa 	L 12						
> ALogin/C		Create		>	Database.		
v 🔁 Tablesp P9_		Refresh					
► Pg_ PostgreSQ >	-						

4. Configure the new database

Enter a name for your new database, for example *training_ungegn*

🚍 Create - Databas	se			×
General Definitio	n Security	Parameters	SQL	
Database	training_ung	lean		
Owner	A postgres			*
Comment				
i ?		× Cancel	C Reset	🖹 Save

5. Add PostGIS extension on the database Right click on the database and choose *Query Tool*



> 🍮 training_un	aean	
> 📑 ujian	Create >	
> ≝up > ≘up2	Refresh	
> 🐴 Login/Group	Delete/Drop	
🗸 📴 Tablespaces	CREATE Script	
🛅 pg_defau	Disconnect Database	
🛅 pg_globa	Maintenance	
 PostgreSQL 15 SAKTI 	Backup	
SAKTI_lama_20 ⁻	Restore	
> 🕅 Server SINAR 20	Grant Wizard	
> 📑 Tes Koneksi	Query Tool	
> 📑 cek_konek	Properties	
> Econ_heyjamie		

Add postgis extension on the database by running SQL query on SQL editor below :

Execute the script

1	Dash	board	Properties	SQL	Statistics	Dependencies	Dependents	🕈 training_u	ngegr	n/postgres	@Postgre8	GQL 12 *	
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\$	S	training_ungegn/postgres@PostgreSQL 12											
0	Quer	y Editor				Exe	cute						
	1	CREAT	E extensio	n pos	tgis;								

3.4 Create Table

At this stage, the creation of a new table is carried out in the database that was created in the previous step. The table is created based on the following design as stated below:

Column Name	Mandatory (YES/NO)	ТҮРЕ	LENGTH
geom_type	Yes	TEXT	40
fclass	Yes	TEXT	40
ftype	Yes	TEXT	75
lat	Yes	Double	
long	Yes	Double	
remark	No	TEXT	254
prov_state	Yes	TEXT	254
regency	Yes	TEXT	254





district	Yes	TEXT	254
name	Yes	TEXT	254
var_name	No	TEXT	254
prev_name	No	TEXT	254
survey_date	Yes	Date	
photo_1	Yes	TEXT	254
photo_2	No	TEXT	254
rec	No	TEXT	254
hist_name	No	TEXT	254
lang_ori	No	TEXT	254

To create a table in PostgreSQL, we can use SQL scripts or utilize the user interface (UI) in pgAdmin. In this training, the table creation is done using SQL scripts. The table mentioned above is translated into the SQL script below to generate toponyms table :

```
CREATE TABLE public.toponyms
(
id toponym serial NOT NULL,
geom geometry (Geometry, 4326) NOT NULL,
geom type character varying (40) NOT NULL,
fclass character varying(40)NOT NULL,
ftype character varying(75)NOT NULL,
lat double precision NOT NULL,
long double precision NOT NULL,
remark character varying(254),
prov state character varying (254) NOT NULL,
regency character varying (254) NOT NULL,
district character varying (254) NOT NULL,
name character varying (254) NOT NULL,
var name character varying(254),
prev_name character varying(254),
survey date date NOT NULL,
photo 1 character varying (254) NOT NULL,
photo 2 character varying(254),
rec character varying(254),
hist name character varying (254),
lang ori character varying(254),
mean name character varying (254),
surveyor character varying (254) NOT NULL,
CONSTRAINT toponym pkey PRIMARY KEY (id toponym)
);
```



The steps in creating toponyms table are explained as follows:

a. Run the script above in the SQL Editor until the successful message appear

Dast	hboard Properties SQL Statistics Dependencies Dependents 🦩 training_ungegn/postgres@PostgreSQL 12 *
в	
~	
\$ ⁵⁷	training_ungegn/postgres@PostgreSQL 12
Quer	ry Editor
1	CREATE TABLE public.toponyms
2	
3	id_toponym serial NOT NULL,
4	geom geometry(Geometry, 4326) NOT NULL,
5	geom_type character varying(40)NOT NULL,
6	fclass character varying(40)NOT NULL,
7	ftype character varying(75)NOT NULL,
8	lat double precision,
9 10	long double precision,
10	remark character varying(254), country character varying(254) NOT NULL,
12	prov state character varying(254) NOT NULL,
13	regency character varying(254) NOT NULL,
14	district character varying(254) NOT NULL,
15	name character varying (254) NOT NULL,
16	var name character varying(254),
17	prev_name character varying(254),
18	survey_date date NOT NULL,
19	<pre>photo_1 character varying(254) NOT NULL,</pre>
20	<pre>photo_2 character varying(254),</pre>
21	rec character varying(254),
22	hist_name character varying(254),
23	<pre>lang_ori character varying(254),</pre>
24	<pre>mean_name character varying(254),</pre>
25 26	surveyor character varying(254) NOT NULL,
20	CONSTRAINT toponym_pkey PRIMARY KEY (id_toponym));
28) ;
20	
Quer	ry Editor Query History Notifications
Data	oUtput Explain Messages
CRE/	ATE TABLE
Quer	ry returned successfully in 91 msec.

b. Access the toponyms within the training_ungegn database by expanding to the "Schema" node and locating the "Public" Schema. Expand the "Public" Schema and the toponyms table will be found in this node.





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c. To view the table, right-click on the toponyms table and select "View/Edit Data" from the context menu. This will open a new window displaying the table data



An empty table will be displayed in the data output section including the column name and the column type. The toponyms table contains several columns, primary key as the unique identifier in which id_toponym column, and geometry column named geom. In the next section of training, the participant will input data to this table.



3.5 Data Processing

In this part, we will add data from the field survey and process the data, which includes spatial data processing and attribute data processing. Therefore, we must check the spatial data obtained from the field survey. For the attribute data, our focus on checking the mandatory columns are not missing, verifying that the data type of mandatory columns are correct, and confirming the values of columns are not null.



1. Add the data to QGIS from Layer Menu \rightarrow Add Layer \rightarrow Add Vector Layer :



Then QGIS will show the dialog to ask the filepath of the vector data (read: field survey data) on the Vector Dataset(s) row \rightarrow Click Add.

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The data will show in the QGIS layer.





- 2. Sometimes a lot of data needs to be corrected in the office which can be challenging to processing in the field. The processing can be divided into two types: spatial data processing and attribute data processing.
 - a. Spatial Data Processing

In this part, we will edit the spatial data, such as repositioning/changing the geometry of the data, because it's very difficult to reposition in the field.

i. Setting the Symbology

Before we edit spatial data, we must set the symbology of the data. It means we set the color of the data to easily see the data by right clicking on the layer \rightarrow Properties \rightarrow Symbology.



Then choose the color on the right box \rightarrow OK. For polygon data, you can click simple fill then choose for fill color and stroke color (outside color).



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ii. Edit Spatial Vertex Editor

Please ensure that the digitizing toolbar has been added to your QGIS interface.

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If the digitizing toolbar is not visible in your QGIS interface, you can enable it by going to the View Menu \rightarrow Toolbars \rightarrow Digitizing Toolbar. This will display the digitizing toolbar in your QGIS interface.





After the digitizing toolbar display in your QGIS interface, follow these steps to Start Editing the spatial data:

Click the Start Editing icon



- Then click Select Features icon (on the Selection Toolbar), you can select the data that you want to edit.
- To reposition/editing the geometry of the data, you can click Vertex Tool icon



(on Digitizing Toolbar).

• To edit the point data you can click the point that you have selected.







To move the point data to the correct position in QGIS, follow these steps:

- Move your mouse cursor to the desired position until the point data icon resembles an "X".
- Click on the buildings or points that you want to move.
- You will see that the point data has now been successfully moved to the new position.

To editing geometry of line or polygon data, follow these steps:

• Click the vertex. The vertex is the point/node in line or polygon data to connect a line or polygon. In QGIS, it is presented with a red "X" icon.





- After you click the vertex, if you want to delete the vertex just click "Delete" on the keyboard. If you want to move it, then move your mouse to the desired position. If you want to add the vertex, there is "+" icon in the middle of two vertices.
- You will see that the vertex data has now been successfully moved to the new position.



- After you editing the spatial data to the truth geometry, then save it by click
 Save Layer Edits icon
- Don't forget to click Toggle Editing icon , to stop editing of the data.
- b. Attribute Data Processing

In this part, we will edit the attribute data especially to check the mandatory columns name, mandatory columns data type, and the values of the mandatory columns. There are differences in attribute data processing collected using KoboToolbox and EpiCollect based on the column names and data types that are generated by their respective systems. Therefore we will discuss both:

1. Data Collection using KoboToolbox

Processing the data collected by KoboToolbox is particularly challenging due to being unable to get latitude and longitude data values as decimal numbers that depend on mandatory columns. Then, we must check the appropriate values for the mandatory columns, like photo_1 and photo_1_URL.

a. Processing the lat and long columns



We can get the values of latitude and longitude as decimal numbers from the QGIS field calculator. To add lat and long columns, follow these steps:

- Right click on the layer \rightarrow Open Attribute Table
- Click Open field calculator icon
- To add new field you can check the box of "Create new field", then fill the output field with the following steps:

<u>.</u>

- For lat columns
 - Output field name : lat
 - Output field type : Decimal number (real)
 - Output field length : 10
 - Precision : 5

Only update 0 selected feature(s)								
Create a new field								
Create virtual fie	Create virtual field							
Output field name	Output field name lat							
Output field type	1.2 Decimal number (real)							
Output field length	10 🕈 Precision 5 🐼 🕈							

- For long columns
 - Output field name : long
 - Output field type : Decimal number (real)
 - Output field length : 10
 - Precision : 5



- Fill the expression box with the following scripts:
 - For point data
 - For lat columns

```
y(transform($geometry, layer_property(@layer,
'crs'),'EPSG:4326'))
```





• For long columns

```
x(transform($geometry, layer_property(@layer,
'crs'),'EPSG:4326'))
```



• For line data

In this case, we will calculate latitude and longitude values of line data from the first coordinate of the vertex line.

• For lat columns

y(start_point(\$geometry))						
	Expression					
		i 🗇 土 主				
	y(start_p	ooint(\$geometry))				

• For long columns

x(start_point(\$geometry))					
Expression Function Editor					
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<pre>x(start_point(\$geometry))</pre>					

• For polygon data

In this case, we will calculate latitude and longitude values of polygon data from the centroid of the polygon.

• For lat columns

y(centroid(\$geometry))



Expression	Function Editor
	i 💼 土 主
y (centroi	d(\$geometry))

• For long columns

x(centroid(\$geometry))						
	Expression					
		î 🕹 🕹				
	x(centroi	d(\$geometry))				

- Click OK.
- b. Processing the photo_1 and photo_2 columns

If we see the values of the photo_1 and photo_2 columns, there is a filename not linked to the photo web page. But we need the photo web page not a filename and photo_1_URL/photo_2_URL wouldn't be saved in PostGIS because there are no photo_1_URL/photo_2_URL columns in the PostGIS table. Therefore, we must update the values of photo_1 and photo_2 to the URL. To update the photo_1 and photo_2 values, follow these steps:

- Right click on the layer \rightarrow Open Attribute Table
- Click Open field calculator icon

 Check Update existing field, choose photo_1 column. In the expression box, type the photo_1_URL/photo_2_URL column. Therefore, the form of a field calculator will be like this.



🔇 trialform — Trial XLSForm 1 — Field Calcula	tor	×
Only update 0 selected feature(s)	Update existing field	
Create virtual field Output field name Output field type U22 Integer (32 bit) Output field length In ♦ Precision 3 Expression Function Editor		
photo_1_URI	Feature geometry id row_number > Aggregates * Arrays Color * Conditionals * Conversions Date and Time * Fields and Values * Files and Paths * Fuzzy Matching	
= + - / * ^ II C) '\n' Feature Faqin Feature Faqin media/original? media/original? media_file=faqihr%' You are editing information on this automatically be turned on.	General General Geometry Map Layers Maps Maps Operators Python	
	OK Cancel	Help

- Click OK
- 2. Data Collection using EpiCollect

Processing the data collected by EpiCollect is particularly challenging due to the presence of various ftype columns. Additionally, the date type column which is represented as text in EpiCollect, needs to be converted to the appropriate date format in the database.

a. Processing the ftype columns

If we see the data structure from epicollect, especially for ftype, there are many ftype columns to represent ftype like ftype_adm, ftype_hydro, etc. Therefore we need, to update (if ftype column exist) or we create a ftype column (if ftype column not exist), follow these steps:

- Right click on the layer \rightarrow Open Attribute Table
- Click Open field calculator icon
- To add new field you can check the box of "Create new field", then fill the output field with the following steps:
 - Output field name : ftype
 - Output field type : Text (string)
 - Output field length : 75



Only update 0 selected feature(s)		
Create a new field		
Create virtual field		
Output field name	ftype	
Output field type	abe Text (string)	
Output field length	75 🖎 🛊 Precision 5	ŧ

If ftype column is exist, check the box of "Update existing field" then choose ftype column below it.

Update existing field	
े ftype	

• Fill the expression box with the following scripts.

CASE		
WHEN ftype_adm IS NOT NULL THEN ftype_adm		
WHEN ftype_hydro IS NOT NULL THEN ftype_hydro		
WHEN ftype_leisure IS NOT NULL THEN		
ftype_leisure		
WHEN ftype_populated IS NOT NULL THEN		
ftype_populated		
WHEN ftype_road IS NOT NULL THEN ftype_road		
WHEN ftype_build IS NOT NULL THEN ftype_build		
WHEN ftype_topo IS NOT NULL THEN ftype_topo		
WHEN ftype_undersea IS NOT NULL THEN		
ftype_undersea		
WHEN ftype_vege IS NOT NULL THEN ftype_vege		
END		



The result from this script is that the following various ftype columns are not empty.

b. Processing the district columns

If we see the data structure from epicollect, especially for districts, there are many district columns to represent districts like district_gianyar, district_klungkung, etc. Therefore we need to update (if district column exist) or we create a district column (if district column not exist), follow these steps:

- Right click on the layer \rightarrow Open Attribute Table
- Click Open field calculator icon
- To add new field you can check the box of "Create new field", then fill the output field with the following steps:
 - Output field name : district
 - Output field type : Text (string)
 - Output field length : 254

Create a new field		
Create virtual fie	ld	
Output field name	district	
Output field type	eles Text (string)	
Output field length	254 🔀 🍦 Precision 3	ŧ





If a district column exists, check the box of "Update existing field" then choose the district column below it.



• Fill the expression box with the following scripts.

```
CASE

WHEN district_gianyar IS NOT NULL THEN

district_gianyar

WHEN district_klungkung IS NOT NULL THEN

district_klungkung

WHEN district_denpasar IS NOT NULL THEN

district_denpasar

WHEN district_badung IS NOT NULL THEN

district_badung

END
```



The result from this script is that the following various district columns are not empty.

c. Processing the survey_date columns

If we see the date columns from right click on the layer \rightarrow Properties \rightarrow Fields. The date column is a text, but in the database is a date. Therefore, we need survey_date column with date type with the following steps:

- Right click on the layer \rightarrow Open Attribute Table
- Click Open field calculator icon

<u>....</u>

- To add new field you can check the box of "Create new field", then fill the output field with the following steps:
 - Output field name : survey_date
 - Output field type : Date
- As we can see from <u>this link</u> discussion, from the function editor box we can add by clicking the green "+" icon and typing "parse_date_dmy" to name it. Then copy this script and paste on the right box → click Save and Load Functions.

You can customize the date format appropriate to your date column from the red script.

```
from qgis.core import *
from qgis.gui import *
from qgis.PyQt.QtCore import QDate
@qgsfunction(args="auto", group='Python')
def parse_date_dmy(fromval, feature, parent):
    return QDate.fromString(fromval, 'dd/MM/yyyy')
```



• Fill the expression box with the following script \rightarrow click OK.





It's an example of data processing from EpiCollect and KoboToolbox, maybe we have some data collection problems for other applications. At least, we have learned



the basics of data processing including spatial data processing and attribute data processing.

3.6 Save to PostGIS

In this part, we will save the data that we have processed to PostGIS. Therefore, others can see our data from the database by database credential. To Save the data to the PostGIS, follow these steps:

Open Save to PostGIS plugin by click Plugins Menu → Toponyms Management → Save to PostGIS



2. Fill the forms that include the credential of the database that you have created the table \rightarrow click Save.

Q Save to PostGIS		×
Host	localhost	
Port	5432	
DB Name	training_ungegn	
User	postgres	
Password	•••••	
Table	toponyms	
Data	percobaan_copy	
		Save Cancel





- a. Host
 : Host of the database. If you want to save on your local computer, the host value is usually "localhost". If you want to save on the server, sometimes its value is a number.
- b. Port : Port of the database. The default value is 5432, maybe it has a different number depending on your database server.
- c. DB Name
 : Database name. In this training, we have set it to "training_ungegn". It depends on the database creation name.
- d. User: User of the database. The default value is "postgres", maybe you have changed it depending on your database credential.
- e. Password : Password of the database. It depends on your password in the database.
- f. Table : Table name in the database that you want to save the data. In this training we have set it to "toponyms".
- g. Data The vector data on the QGIS layer that is ready to save in PostGIS.

3. Successful, Info, and Warning Messages in QGIS Message

After you click Save on the "Save to PostGIS" plugin, it will return messages. The messages are divided into two categories. The categories are successful and warning messages.

a. Successful messages.

This message will show when your data is perfect and your data has been saved in PostGIS.

2023-05-29T13:57:33 SUCCESS Success : Your data has been successfully saved in PostGIS!

b. Info messages.

This message will show when the optional columns are missing in your data. The data would be saved in PostGIS when all of the mandatory columns exist. But if the mandatory columns are missing, it wouldn't saved in PostGIS

2023-05-29T14:15:33 INFO Info : The following optional columns are missing in the layer data : rec.



c. Warning messages.

The warning messages will raise python exception errors. There are 3 categories of warning messages when the plugin found the mandatory columns are not appropriate in the database. Inappropriate mandatory columns are divided based on :

1. Mandatory columns are missing

The plugin will detect the selected data for the availability of mandatory columns in the database to your data. The plugin will raise an exception python error when it finds the mandatory columns are missing. This is an example of the message when the mandatory columns are missing.

2023-05-29T14:24:13 WARNING Warning : The following mandatory columns are missing in the layer data : ftype, geom_type.

2. Mandatory columns data type is not appropriate

The plugin will detect the selected data for a data type of mandatory columns in the database to your data. The plugin will raise an exception python error when it found the data type of mandatory columns is not appropriate with the data type in the database. This is an example of the message when the data type of mandatory columns is not appropriate.

2023-05-29T14:25:43 WARNING Warning : Please check the following mandatory columns data type : ftype, survey_date. The data types are different with the database!

3. NULL values in mandatory columns

The plugin will detect the values of selected data. The plugin ensures that the mandatory column values are not null. It's because we have set the mandatory columns that are not null in the database. This is an example of the message when the plugin detects NULL values of the data.

2023-05-29T14:25:43 WARNING Warning : Please check the following mandatory columns value : geom_type. There are NULL values!

The warnings serve as a reminder that if the mandatory columns are not appropriately set, the data will not be saved in PostGIS. Therefore, it's crucial to thoroughly check the mandatory columns to ensure the data can be successfully stored in PostGIS. Here are the table guidelines for the mandatory columns.

Column Name	Data Type	Character Maximum Length
geom_type	character varying/text/string	40
fclass	character varying/text/string	40





ftype	character varying/text/string	75
lat	double precision/real	-
long	double precision/real	-
prov_state	character varying/text/string	254
regency	character varying/text/string	254
district	character varying/text/string	254
name	character varying/text/string	254
survey_date	date	-
photo_1	character varying/text/string	254
surveyor	character varying/text/string	254

4. View Data in PostGIS

To ensure the data has been successfully saved in PostGIS, you can open pgAdmin \rightarrow input your master password \rightarrow expand the "training_ungegn" database by username and password \rightarrow expand Schemas \rightarrow expand public \rightarrow expand Tables \rightarrow right click on toponyms \rightarrow View/Edit Data \rightarrow click All Rows.





Therefore, if the data has been successful, we can see the table will add a new row marked by id_toponym row number addition.



