Using GeoPackage as work and exchange format

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GeoPackage

- OGC Standard published 2014
- “An open standard non-proprietary platform-independent GeoPackage container for distribution and direct use of all kinds of geospatial data”
- Vector and Raster data stored in SQLite file DB
- http://www.geopackage.org/

GeoPackage introduction

- **Spatial extension to SQLite embedded database**
  - Like PostGIS extends PostgreSQL
  - File based with SQL API
- **Spatial data types**
- **Raster and tile pyramid data sets**

GeoPackage data

- **OGC Simple Feature types (WKT, WKB)**
  - Point, MultiPoint
  - LineString, MultiLineString
  - Polygon, MultiPolygon
  - XY, XYZ, XYM, XYZM
- **WKB based BLOB**
- **One geometry column per table**
- **R*Tree index tables**
- **Raster tile sets (PNG, JPEG)**

Implementations

- GDAL
- QGIS
- GeoTools
- GeoServer
- FME Desktop & Server (vector)
- ArcGIS for Desktop, ArcGIS Pro (reading)
- Geomedia (new default format)
- MapInfo
- and many more....

Usage with GDAL

- **Convert to GPKG**

```
ogr2ogr -f GPKG countries.gpkg countries.shp
```

- **Import raster**

```
gdal_translate -of countries.tif
countries_raster.gpkg -co RASTER_TABLE=countries
```

https://www.gdal.org/drv_geopackage.html

https://www.gdal.org/drv_geopackage_raster.html

GDAL supports also curved geometries and the non-standard types Triangle, PolyhedralSurface and TIN

PostGIS dump & restore

- **Dump DB as GPKG**

```
ogr2ogr -f GPKG ne.gpkg PG:dbname=naturalearth
```

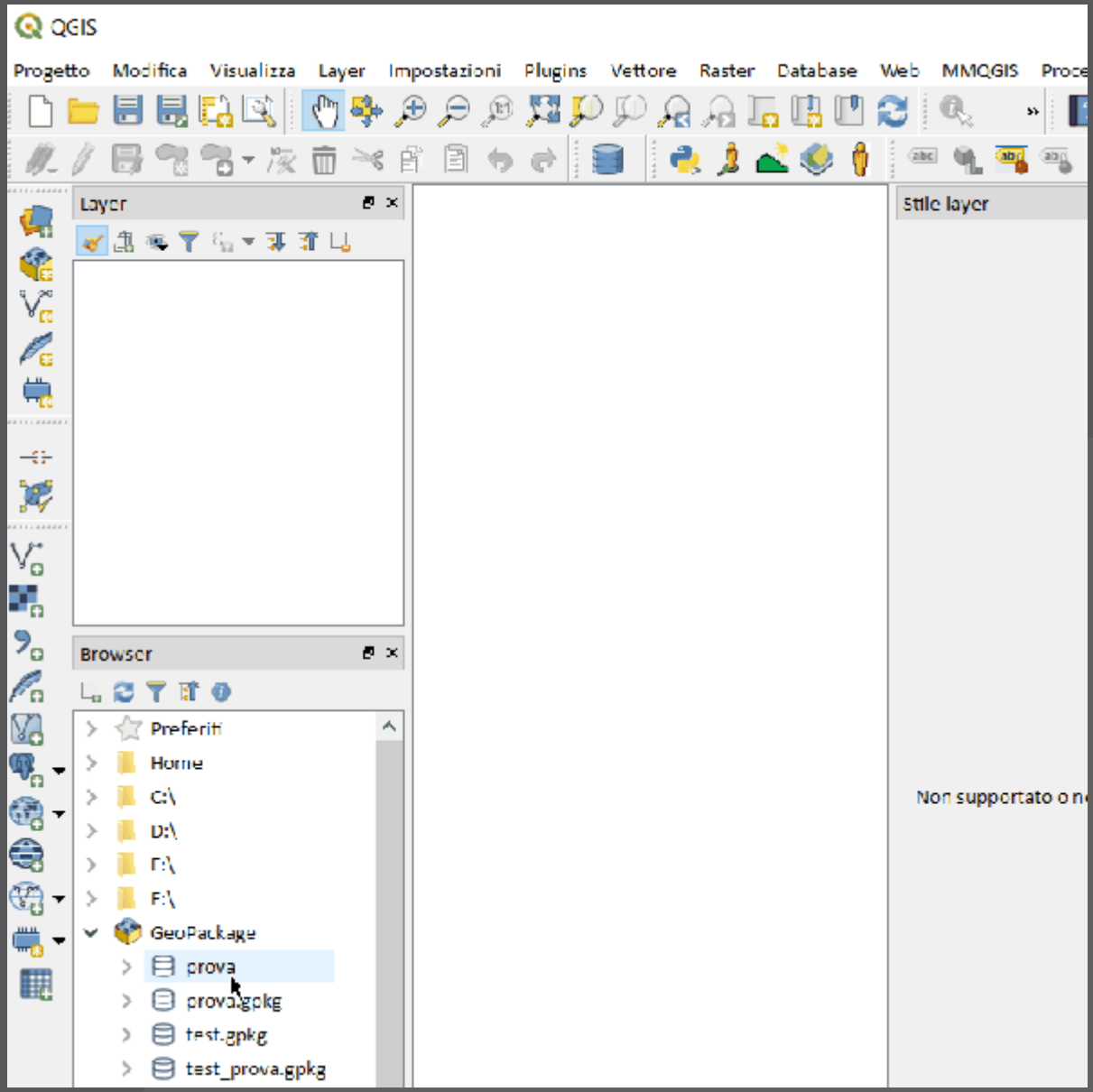
- **Restore DB from GPKG**

```
psql postgres -c "CREATE DATABASE ne"
psql ne -c "CREATE EXTENSION postgis"
ogr2ogr -f PostgreSQL PG:dbname=ne ne.gpkg
```

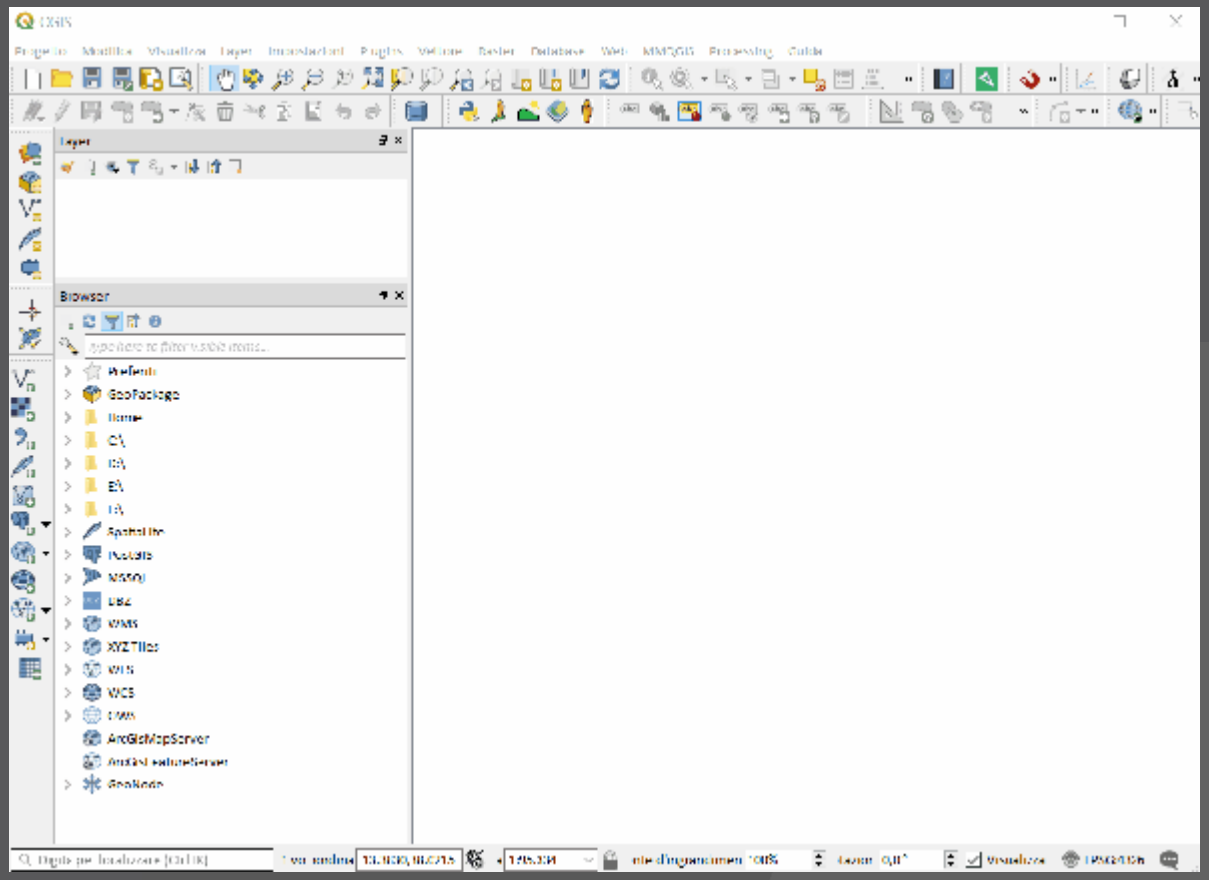
Using GPKG in QGIS

- Based on OGR driver
- Load from Browser, Drag and Drop, File dialog
- Create new GeoPackage
- Digitizing, Saving
- Intermediate format in Processing
- Limitations:
  - Column editing (Rename, Add, Remove)
  - Editing views

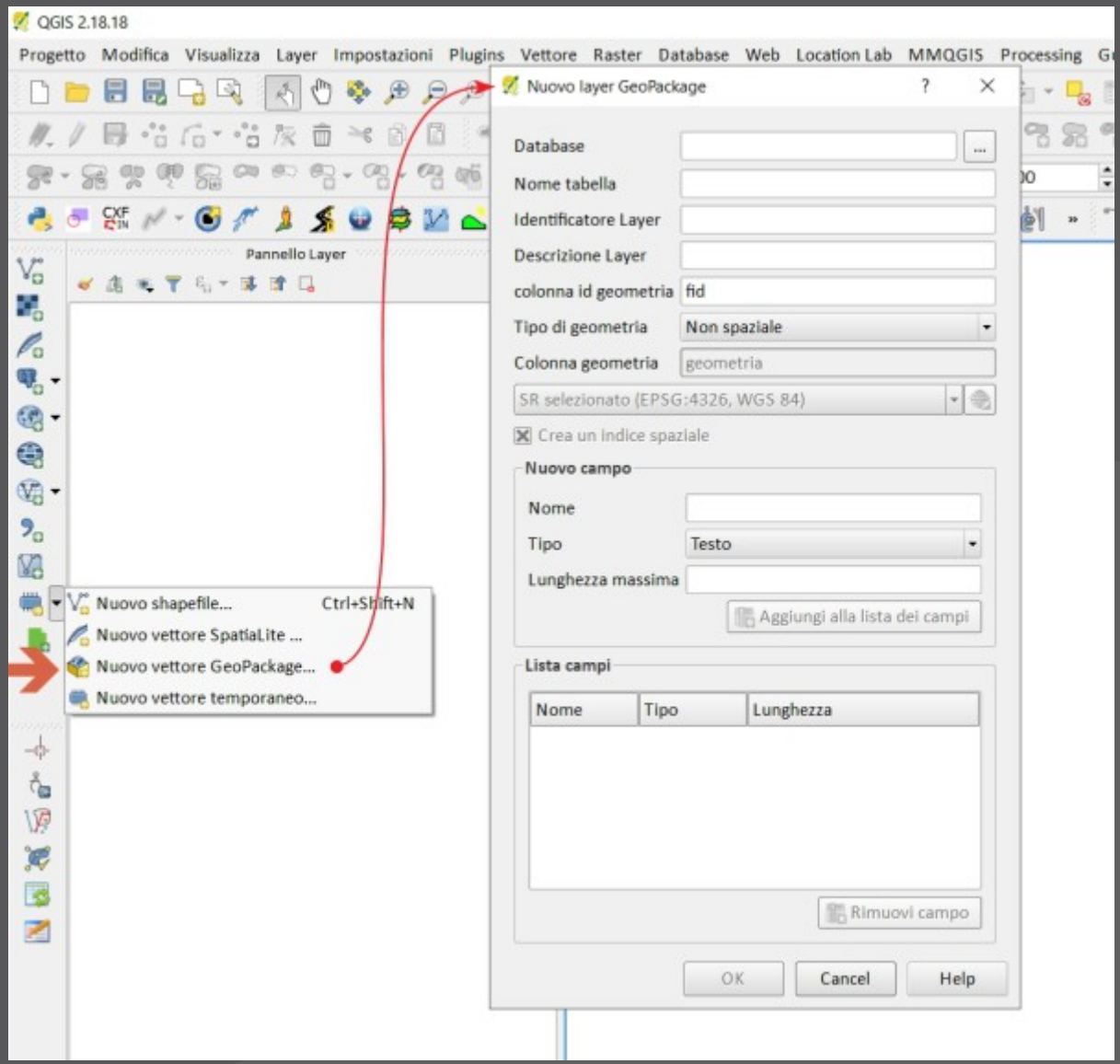
Load from Browser



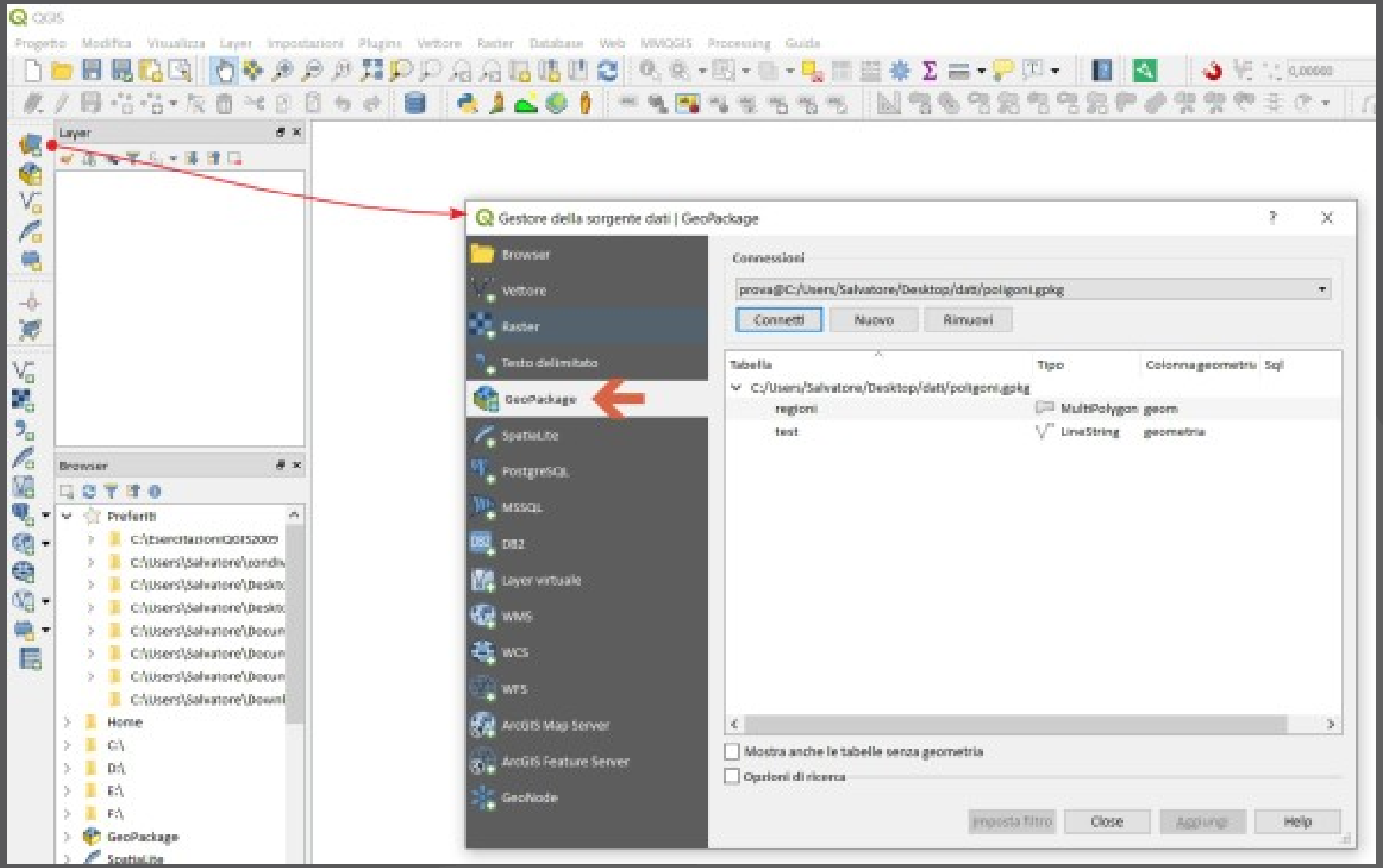
Load raster layer



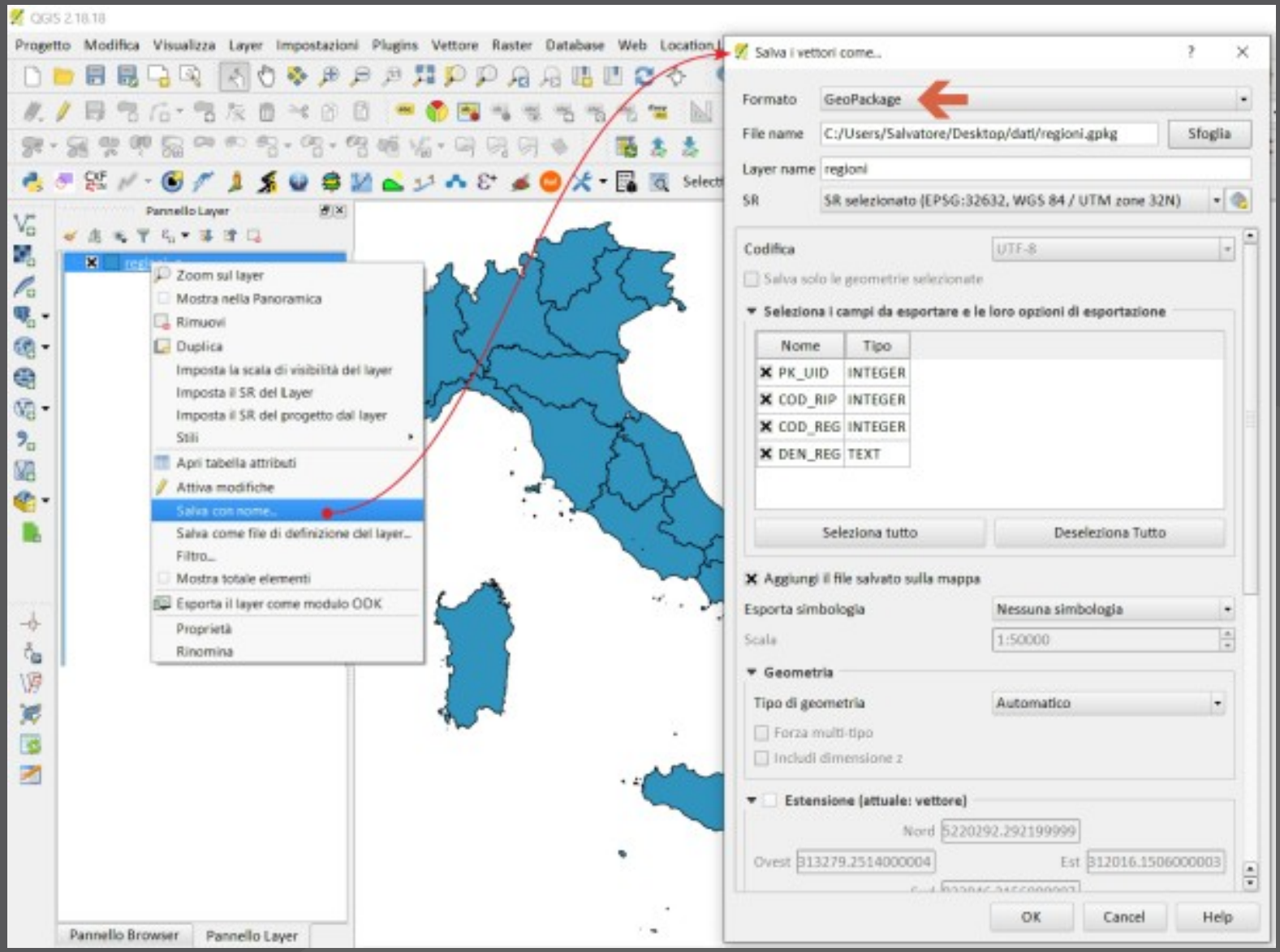
Create new GPKG



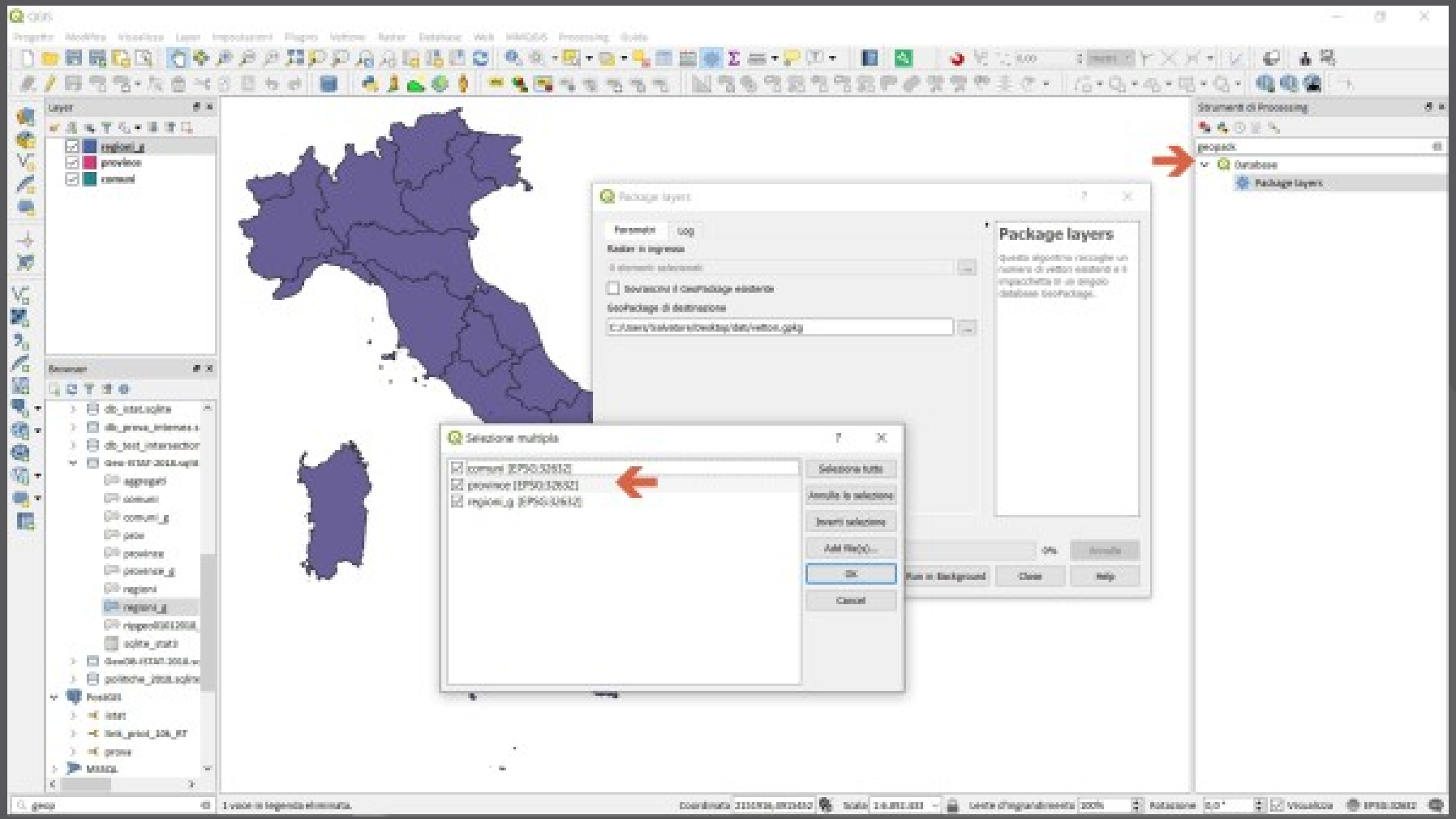
Import GPKG


Layer
Browser
Preferiti
Home
GeoPackage
Gestore della sorgente dati | GeoPackage
Browser
Vettore
Raster
Testo delimitato
GeoPackage
SpatiaLite
PostgreSQL
MSSQL
DB2
Layer virtuale
WMS
WCS
WFS
ArcGIS Map Server
ArcGIS Feature Server
GeoNode
Connessioni
prova@C:/Users/Salvatore/Desktop/dati/poligoni.gpkg
Connetti
Nuovo
Rimuovi
Tabella
Tipo
Colonna geometria
Sql
C:/Users/Salvatore/Desktop/dati/poligoni.gpkg
regioni
MultiPolygon
geom
test
LineString
geometria
Mostra anche le tabelle senza geometria
Opzioni di ricerca
Imposta filtro
Close
Applica
Help

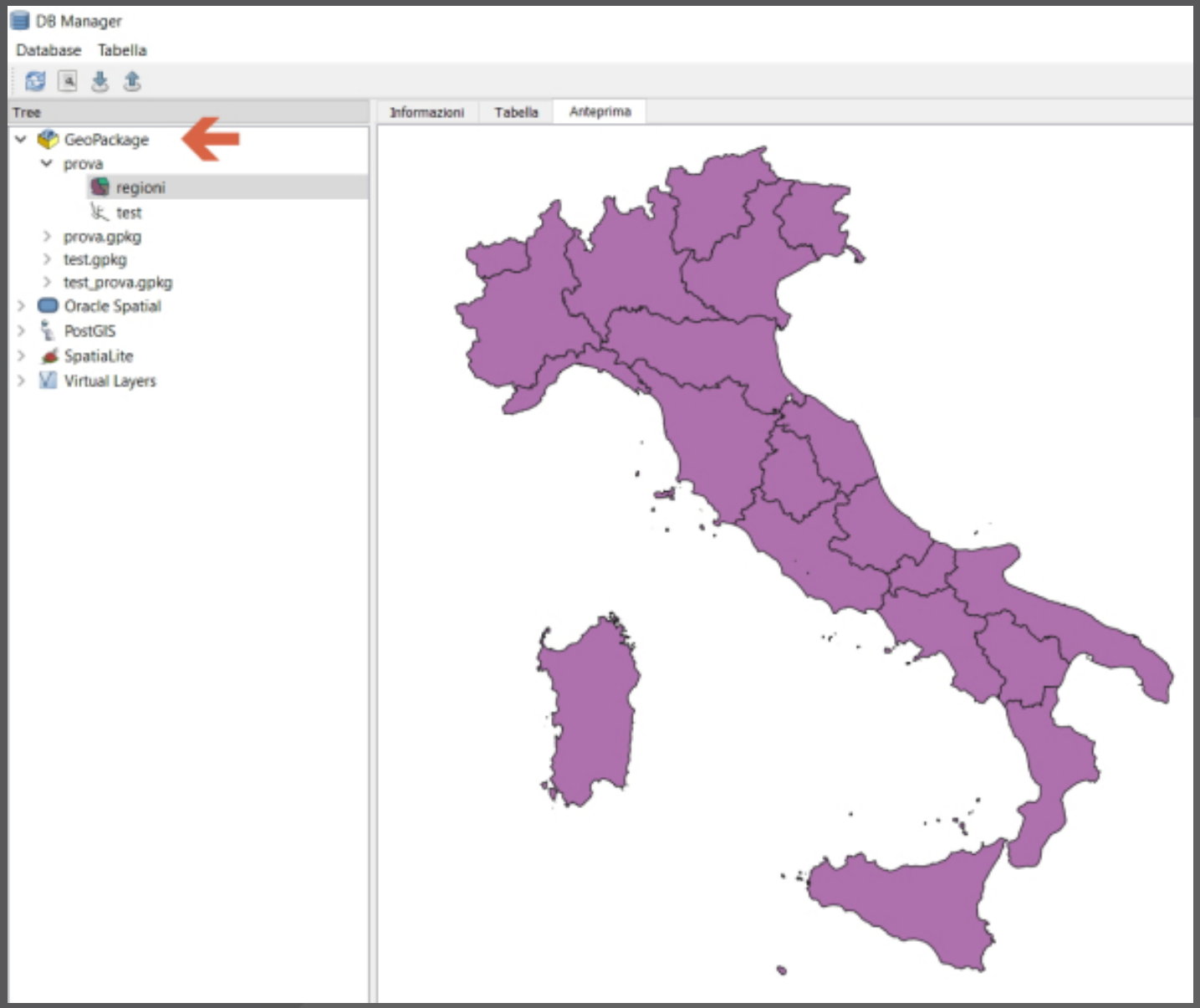
Export layer as GPKG



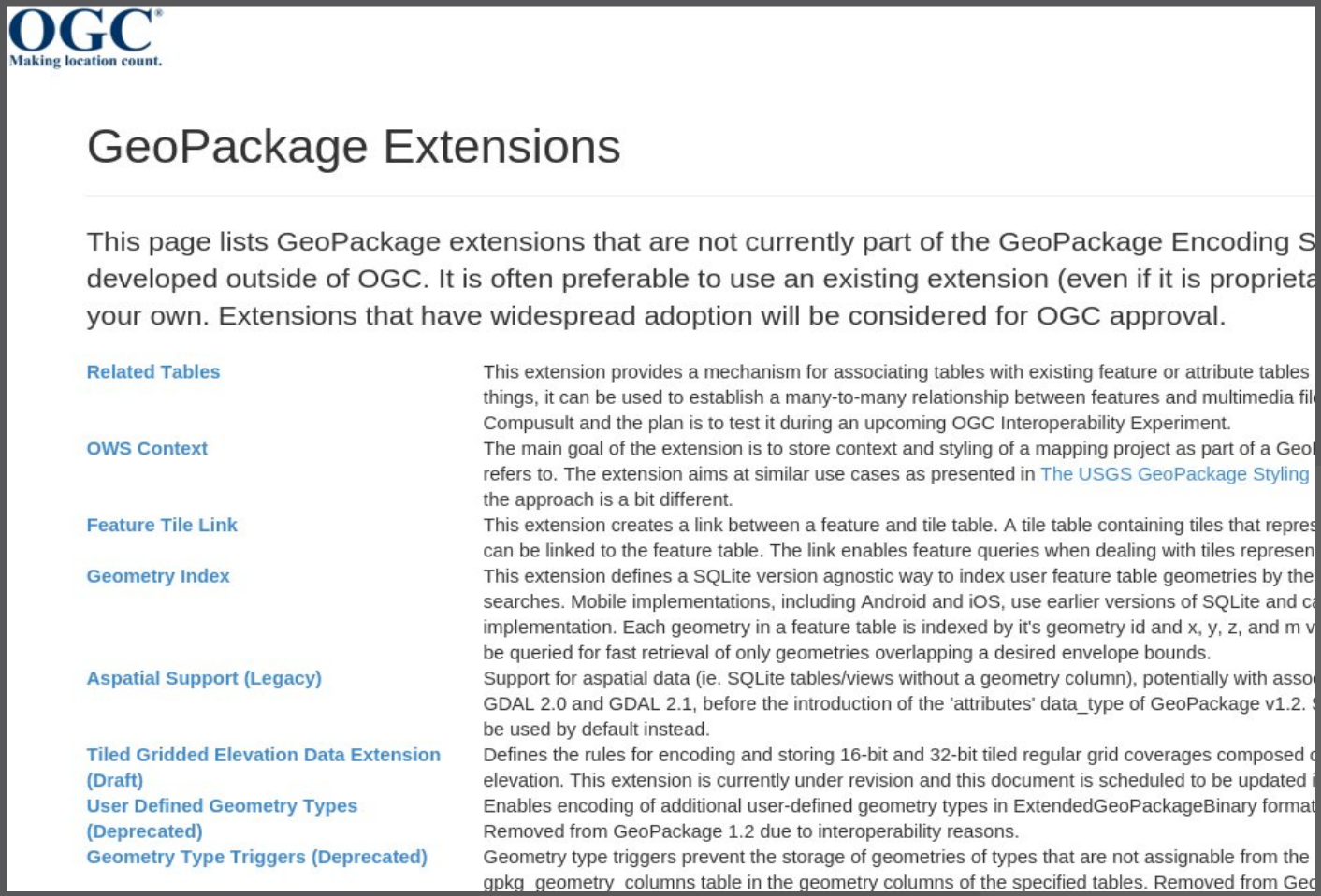
Package layers (Processing)



DB Manager


DB Manager
Database
Tabella
Tree
GeoPackage
prova
regioni
test
prova.gpkg
test.gpkg
test_prova.gpkg
Oracle Spatial
PostGIS
SpatiaLite
Virtual Layers
Informazioni
Tabella
Anteprima

Extensions



OGC
Making location count.

GeoPackage Extensions

This page lists GeoPackage extensions that are not currently part of the GeoPackage Encoding S
developed outside of OGC. It is often preferable to use an existing extension (even if it is proprieta
your own. Extensions that have widespread adoption will be considered for OGC approval.

Related Tables	This extension provides a mechanism for associating tables with existing feature or attribute tables things, it can be used to establish a many-to-many relationship between features and multimedia fil Compusult and the plan is to test it during an upcoming OGC Interoperability Experiment.
OWS Context	The main goal of the extension is to store context and styling of a mapping project as part of a Geo refers to. The extension aims at similar use cases as presented in The USGS GeoPackage Styling the approach is a bit different.
Feature Tile Link	This extension creates a link between a feature and tile table. A tile table containing tiles that repres can be linked to the feature table. The link enables feature queries when dealing with tiles represen
Geometry Index	This extension defines a SQLite version agnostic way to index user feature table geometries by the searches. Mobile implementations, including Android and iOS, use earlier versions of SQLite and c implementation. Each geometry in a feature table is indexed by it's geometry id and x, y, z, and m v be queried for fast retrieval of only geometries overlapping a desired envelope bounds.
Aspatial Support (Legacy)	Support for aspatial data (ie. SQLite tables/views without a geometry column), potentially with asso GDAL 2.0 and GDAL 2.1, before the introduction of the 'attributes' data_type of GeoPackage v1.2. be used by default instead.
Tiled Gridded Elevation Data Extension (Draft)	Defines the rules for encoding and storing 16-bit and 32-bit tiled regular grid coverages composed elevation. This extension is currently under revision and this document is scheduled to be updated
User Defined Geometry Types (Deprecated)	Enables encoding of additional user-defined geometry types in ExtendedGeoPackageBinary format Removed from GeoPackage 1.2 due to interoperability reasons.
Geometry Type Triggers (Deprecated)	Geometry type triggers prevent the storage of geometries of types that are not assignable from the gpkg_geometry_columns table in the geometry columns of the specified tables. Removed from Geo

http://www.geopackage.org/extensions.html

GeoPackage extensions (selection)

- **Non-Linear Geometry Types**
  - http://www.geopackage.org/spec/#extension_geometry_types
- **Tiled Gridded Coverage Data**
- **User extensions:**
  - Related Tables
  - Feature Tile Link
  - OWS Context
  - Vector tiles
  - 3D Tiles
  - QGIS Map styling information

QGIS map styling extension

- Store QGIS projects in GPKG-File
- Includes graphics for styling (e.g. SVG markers) and print layouts (e.g. JPEG logos)
- Implemented as QGIS plugin
- Exchange data including map views!
  - https://github.com/pka/qgpkg

GPKG Plugin

Data + QGIS Project +
Resources

GeoPackage summary

- Data exchange *and* direct use
- Single file
- Vector *and* raster
- From mobile to server
- Custom extensions mechanism
- Promote GeoPackage
  - Provide GeoPackage
  - Ask for GeoPackage
- Best Open Data exchange format

Thank you!

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Credits:

Salvatore Fiandaca https://pigrecoinfinito.wordpress.com/