

EPSG codes - a blessing or a curse?

Euref symposium Barcelona, June 2024

What is EPSG

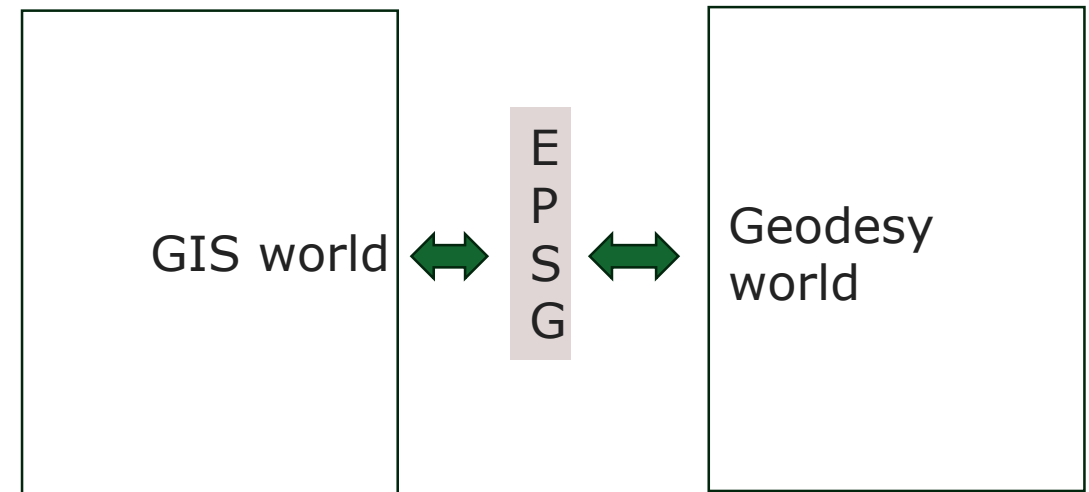
From WWW:

- EPSG stands for **E**uropean **P**etroleum **S**urvey **G**roup
- It's a public registry of geodetic datums, spatial reference systems, Earth ellipsoids, coordinate transformations, and related units of measurement.
- An EPSG code is a **unique identifier** for different coordinate reference systems.
- the EPSG Dataset is the **de facto global standard** for coordinate reference system descriptions for use in spatial software
- Adapted by Open Geospatial Consortium (OGC)

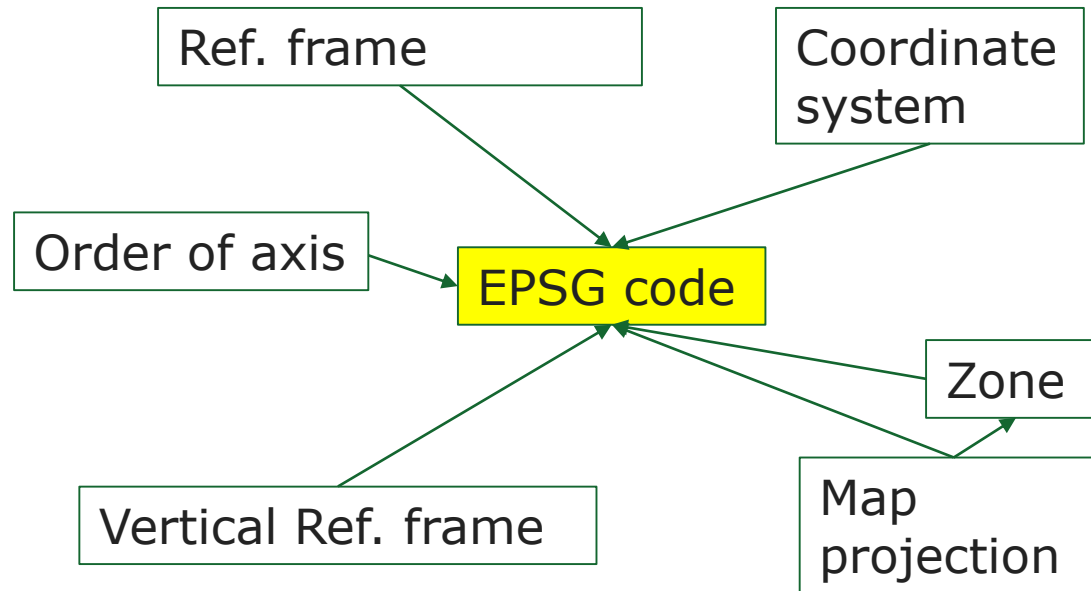


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An interface between GIS and Geodesy



What is in the codes



The EPSG code is the identifier of the set of information necessary for the definition of a CRS

Why a blessing?

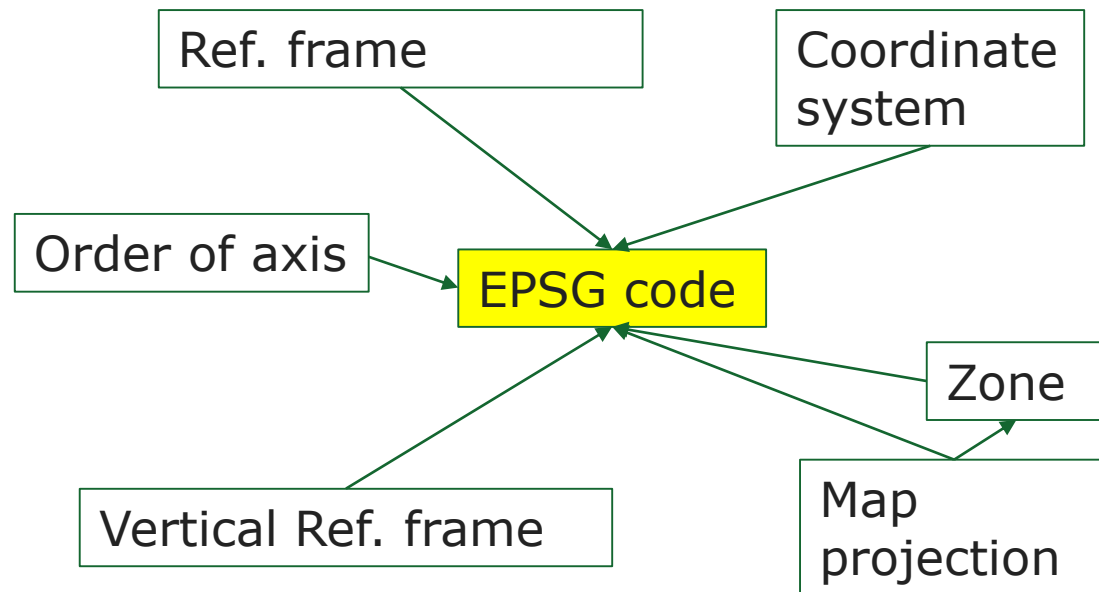
- “GIS people do not have to thing about difficult and boring geodesy stuff”
- “Everything is in the EPSG code”
- Only two parameters needed for coordinate operations between CRS: **From-EPSSG-code** and **To-EPSSG-code**
- Widely used in the GIS-world. E.g., in ESRI-products and QGIS
- Integrated into Proj

It makes life easier!

Why a curse?

- #1 There are too many
 - From 200 - 350 codes available for many European country
- #2 For dynamic reference frames there are no reference epoch for the coordinates
- #3 Hard to know if you may mix data having different EPSG codes
- #4 Even though there are too many, some are also missing

#1 Too many codes



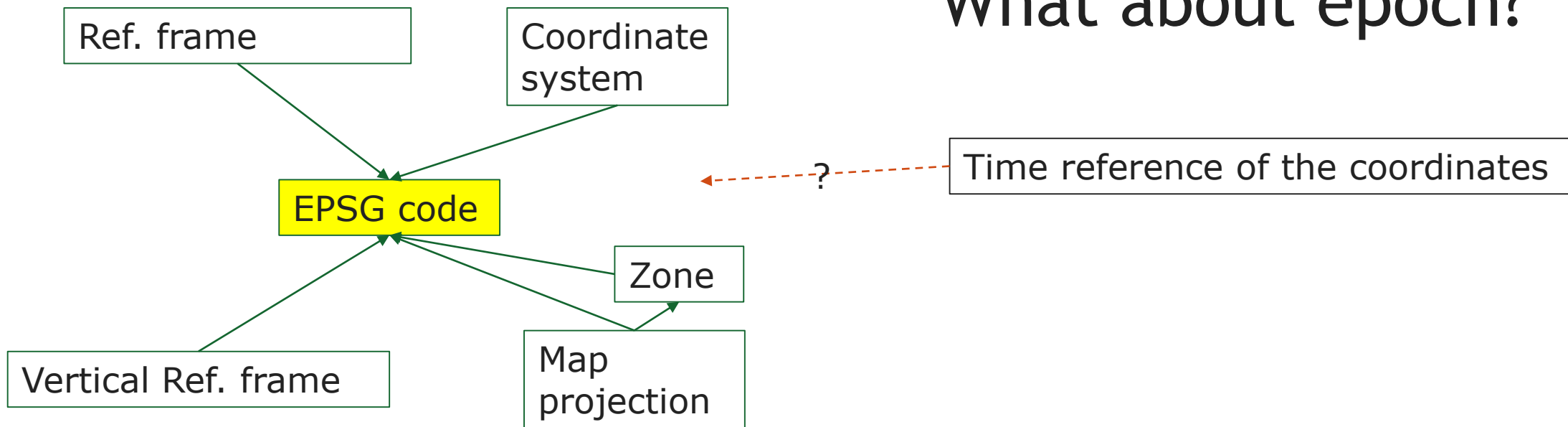
Especially for projected coordinate reference systems:

If you combine all **Ref. frames** with all **Map projections** with all **Zones** with all **Vertical Ref. frames**....

.... you get a high number

.... which is doubled if you specify the order of axis

#2: Dynamic reference frames



#3 Hard to know if you may mix data having different EPSG codes

| | Name | Type of CRS | EPSG code | Datum code |
|--------|---|----------------------|-----------|------------|
| Norway | <u>EUREF89 UTM zone 33, 2d + NN2000</u> | Projected + vertical | 5973 | 6258, 1096 |
| Sweden | SWEREF99 TM + RH2000 height | Projected + vertical | 5845 | 6619, 5208 |

I asked ChatGPT

May I mix coordinates having EPSG-code 5973 with coordinates having EPSG code 5845?

Answer:

You cannot directly mix coordinates with EPSG code 5973 with coordinates with EPSG code 5845 without converting them to the same coordinate reference system (CRS).

EPSG codes refer to specific coordinate systems that have different reference points and projection methods. Therefore, you must perform a coordinate transformation to ensure the coordinates are in the same CRS before using them together.

Here are the steps to convert coordinates from one EPSG code to another:

1. Identify the Coordinate Systems:



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- **EPSG:5973** - Determine what type of coordinate system this is (projection, geodetic datum, etc.).
- **EPSG:5845** - Similarly, determine the details of this coordinate system.

2. Use a GIS Software:

- Load the coordinates into a GIS software like QGIS or ArcGIS.
- Use the transformation tool and specify the source and target EPSG codes.

3. Transformation:

- Specify EPSG:5973 as the source system and EPSG:5845 as the target system (or vice versa, depending on the direction you need to convert).
- The software will perform the necessary mathematical computations to convert the coordinates correctly.

..... more

#4 Missing codes

| Authority | Name | Type of CRS | EPSG code | Reference frame (Datum) |
|-----------|----------------|-----------------------------|-----------|-------------------------|
| Norway | <u>EUREF89</u> | Geographic 2D | 4258 | ETRS89-Ensemble |
| Finland | EUREF-FIN | Geographic 2D | 4258 | ETRS89-Ensemble |
| | | | | |
| | ITRF2020 | Geographic 2D/ Projected | Missing | |
| | IGS20 | Geographic 2D/ Projected | Missing | |
| | GTRF | Any | Missing | |

WGS84

| CRS | CRS type | EPSG | | Datum | |
|---|---------------|-------|------------|-------|--------------------|
| <u>WGS 84 / UTM zone 32N</u> | Projected | 32632 | "Ensemble" | 6326 | ACCURACY 2m |
| WGS 84 -- WGS84 - World Geodetic System 1984, used in GPS | Geographic 2D | 4326 | "Ensemble" | 6326 | ACCURACY 2m |
| WGS 84 (G1762) | Geographic 2D | 9755 | DYNAMIC | 1309 | FRAMEEPOCH[2016.0] |
| WGS 84 | Geocentric 3D | 4978 | "Ensemble" | 6326 | ACCURACY 2m |

Is the EPSG-regime sustainable in the future?

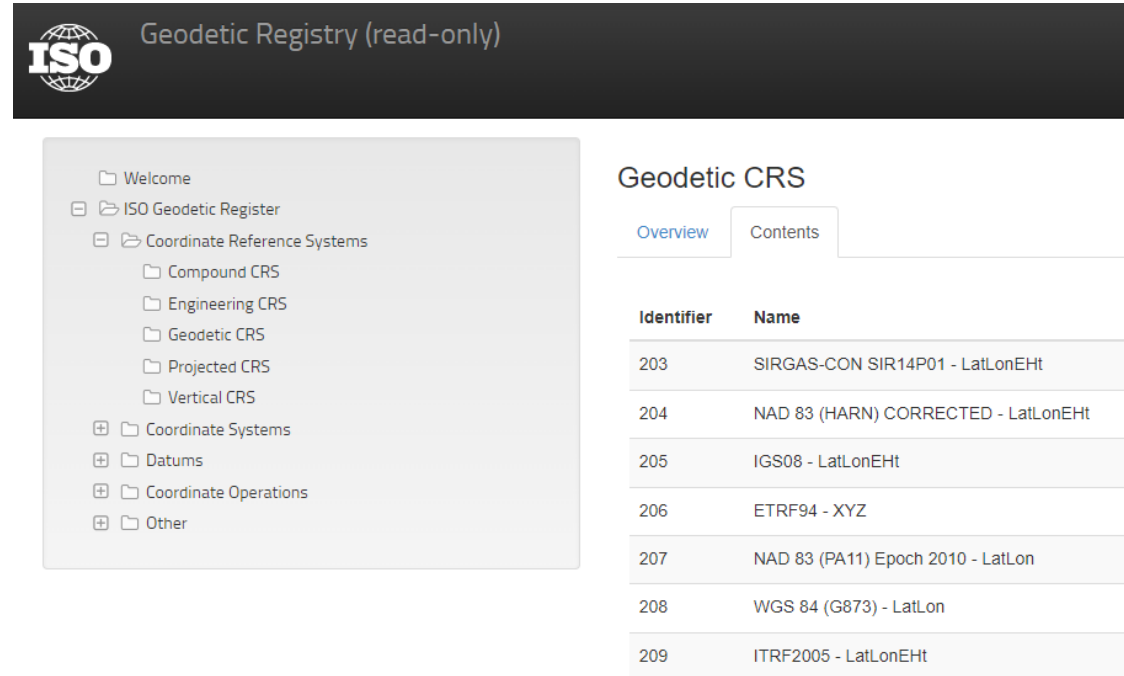
Depends on:

- What role will dynamic reference frames play in the management of geographical data
- The development of international real-time services operating in dynamic reference frames
- The number of codes must be manageable
- Is it a problem that the EPSG-register is managed and owned(?) by the oil industry (International Association of Oil & Gas Producers)?

Is there an alternative to the EPSG codes?

ISO Geodetic Registry

- Built on the same idea: One code or identifier for each CRS
- Uncomplete (only one Projected CRS)
- Have the same problems with epoch in dynamic reference frames



The screenshot shows the ISO Geodetic Registry (read-only) website. On the left is a navigation menu with the following items: Welcome, ISO Geodetic Register, Coordinate Reference Systems (expanded), Compound CRS, Engineering CRS, Geodetic CRS, Projected CRS, Vertical CRS, Coordinate Systems, Datums, Coordinate Operations, and Other. The main content area is titled 'Geodetic CRS' and has two tabs: 'Overview' (selected) and 'Contents'. Below the tabs is a table with two columns: 'Identifier' and 'Name'.

| Identifier | Name |
|------------|-------------------------------------|
| 203 | SIRGAS-CON SIR14P01 - LatLonEht |
| 204 | NAD 83 (HARN) CORRECTED - LatLonEht |
| 205 | IGS08 - LatLonEht |
| 206 | ETRF94 - XYZ |
| 207 | NAD 83 (PA11) Epoch 2010 - LatLon |
| 208 | WGS 84 (G873) - LatLon |
| 209 | ITRF2005 - LatLonEht |

Are ESPG-codes a matter for Euref?

Yes!

And we invite everyone to the EuroSDR workshop
in Tromsø, Norway, this fall

Topic for the workshop: Sharing data across borders

Summary

- The idea of EPSG-codes is fine, but the realization can be better.
- Using EPSG-codes in dynamic reference frame is a challenge
- EPSG-codes are a matter for Euref



Questions?

Contact info

→ Olav Vestøl

→ Olav.vestol@kartverket.no



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