



PaTuli spatial data in Puhti

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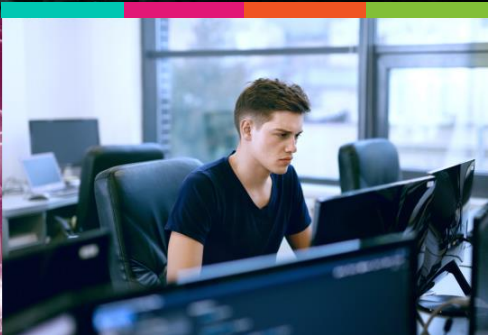


PaTuli

• www.csc.fi/paituli

- Open to everybody, but targeted for academic users
- Data of Finland, mostly from governmental organizations
- Finnish universities and research institutes can share own data
- Includes historical versions of data (2005 ->)
- Main statistics: 13 Tb data, 266 datasets, 2600+ users
- CSC operates the service, Ministry of Culture and Education supports the service, free of charge for end-users

PaTuli datasets



Paituli datasets producers

- Finnish Digital and Population Data Services Agency
- Finnish Food Agency
- Finnish Meteorological Institute (FMI)
- Finnish Transport Infrastructure Agency, Digiroad
- Institute for the Languages of Finland (KOTUS)
- Latuviitta
- National Land Survey (MML)
- Natural resource institute Finland (LUKE)
- Statistics Finland
- University of Helsinki, Digital Geography Lab

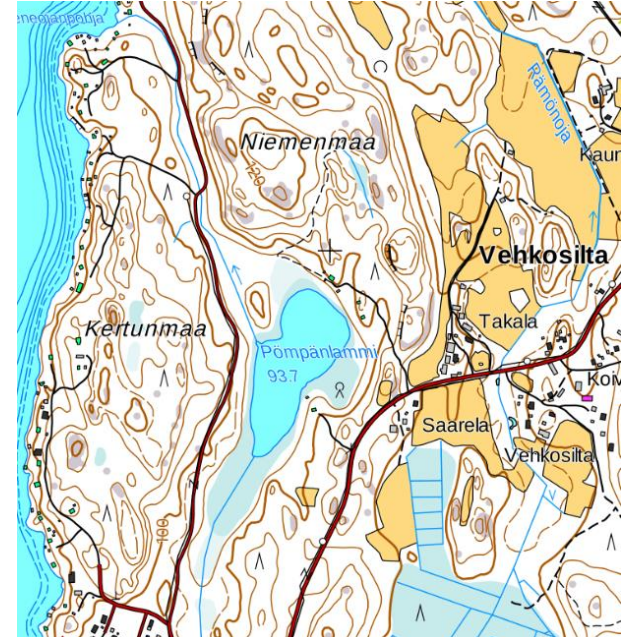
- 1:20 000
- 2005->
- PNG, TIFF

NLS, basic map

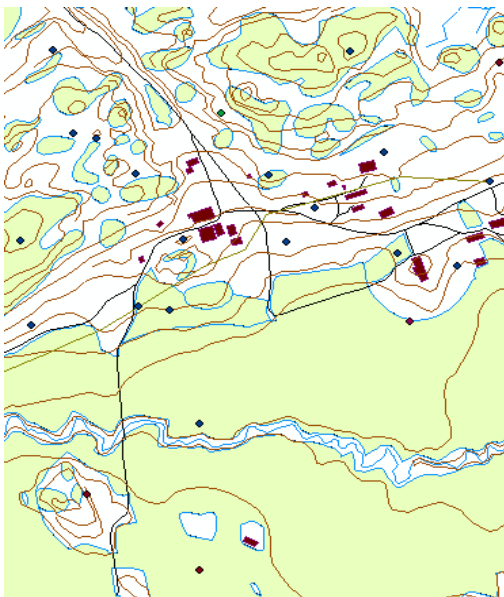
Background color



Print color



- 1:10 000
- 2005->
- SHP for map sheets
- GeoPackage all Finland in one thematic file



© Maanmittauslaitos 2010

NLS, topographic database



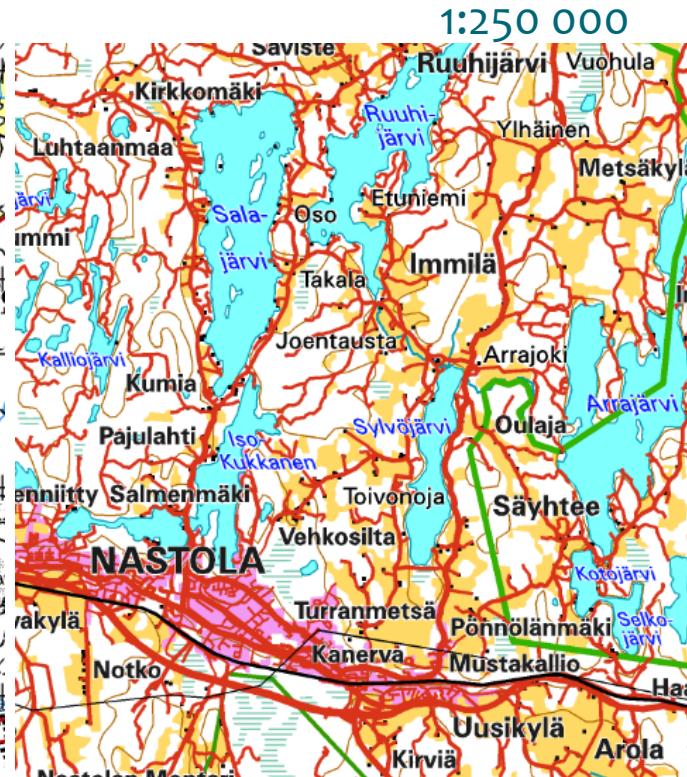
- Traffic
 - Road, streets, tracks, railways, ferries, airports
- Buildings
- Administrative borders
- Place names
- Land use
- Water
 - Sea, lakes, rivers, streams, springs
- Contours, height and depth
- ...

1:50 000 – 1:4 500 000

2005->

PNG/TIFF, SHP

NLS, topographic and general maps



1:10 000

NLS, ortho images

1997->

JPG2000

Normal color



Infrared

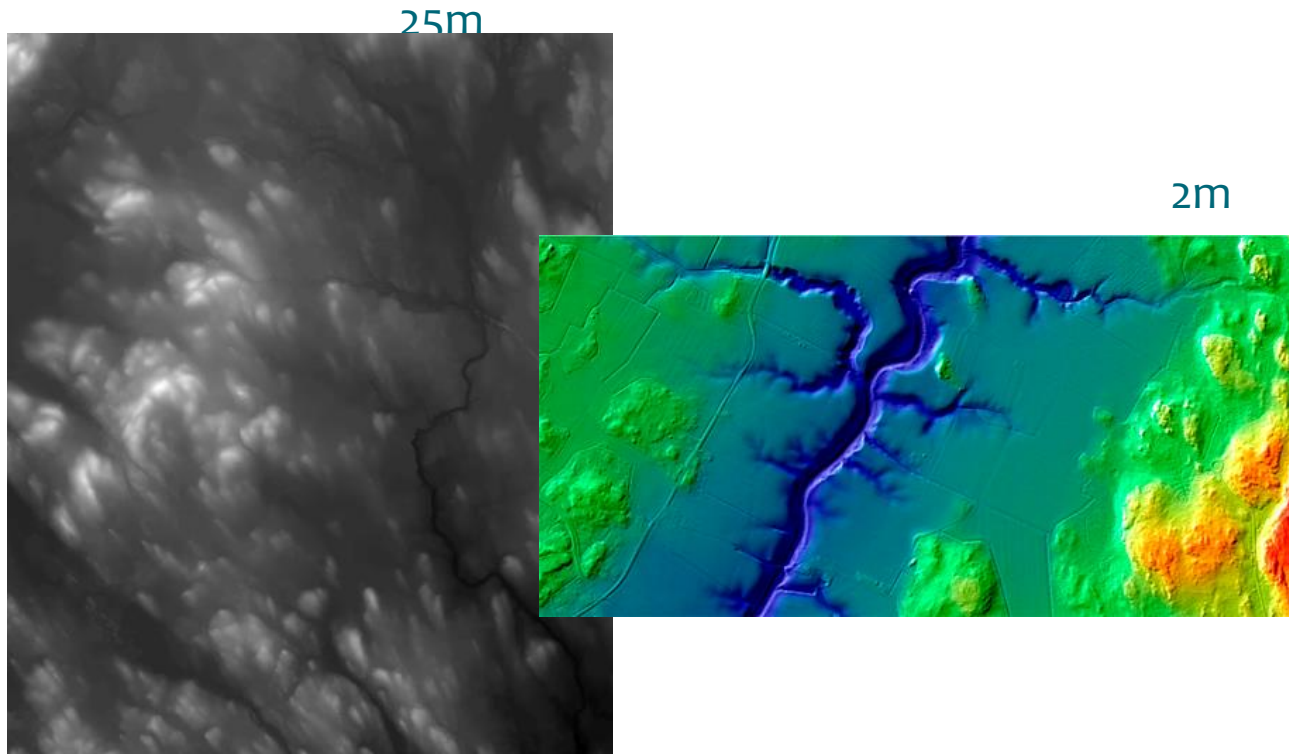


Black-and-white
(some old images)

- 25m, 10m and 2m

- TIFF

NLS, DEM, digital elevation model

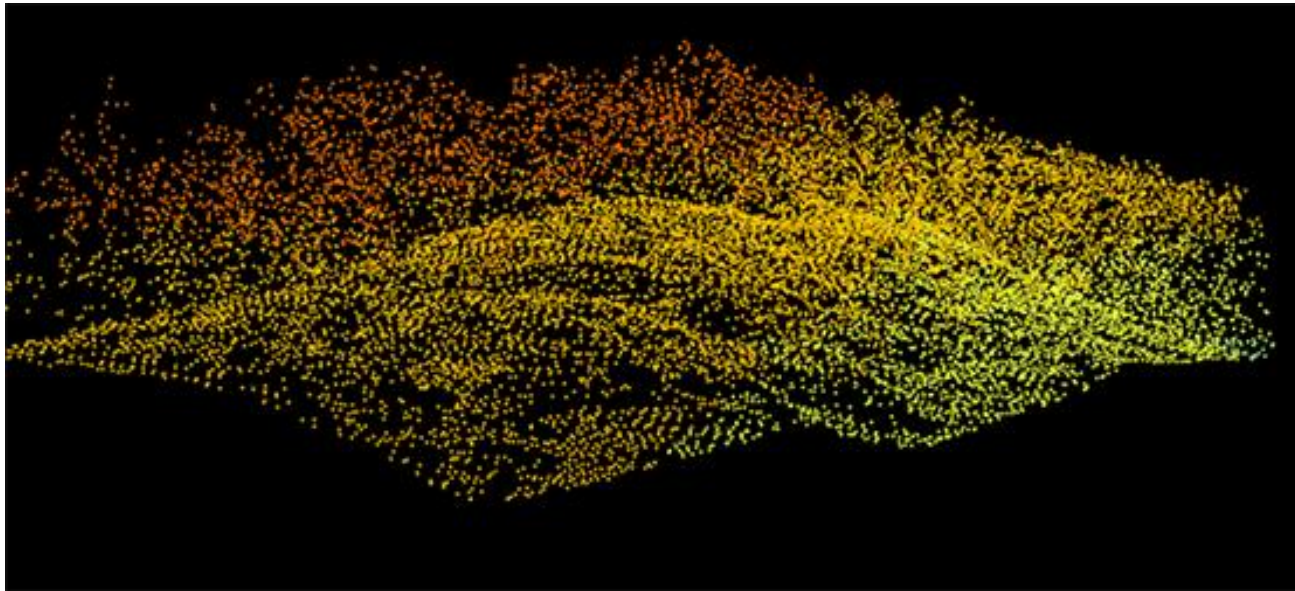


- 0,8 points / m²

- 2008->

- LAZ

NLS, lidar



1:10 000 – 1:1 000 000

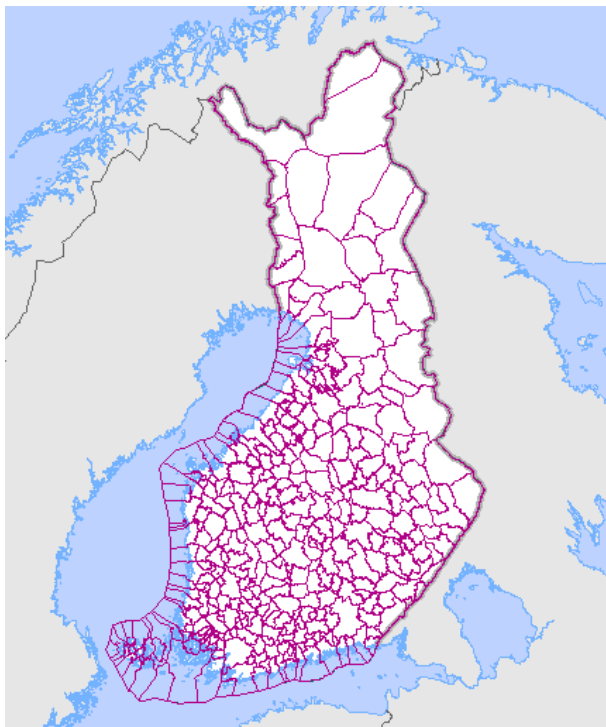
2005->

SHP

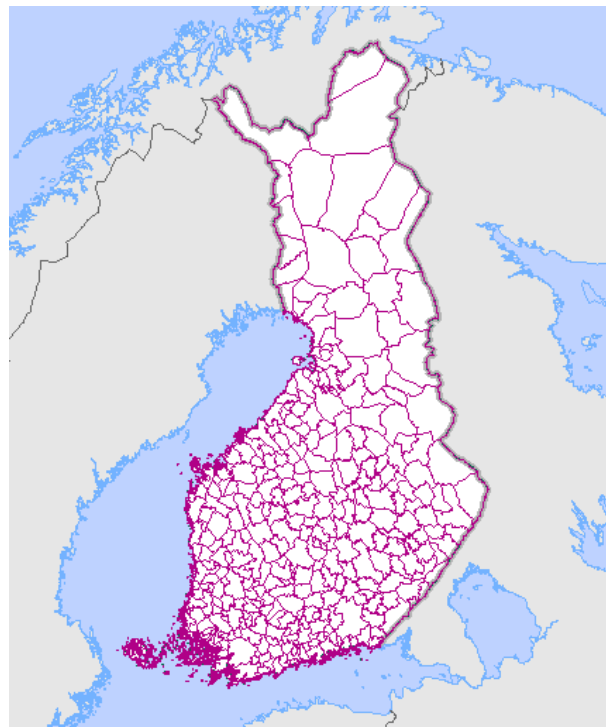
NLS, administrative borders



1:10 000



1:1 000 000, for thematic maps



- 1:10 000
- 2006->
- SHP + DBF

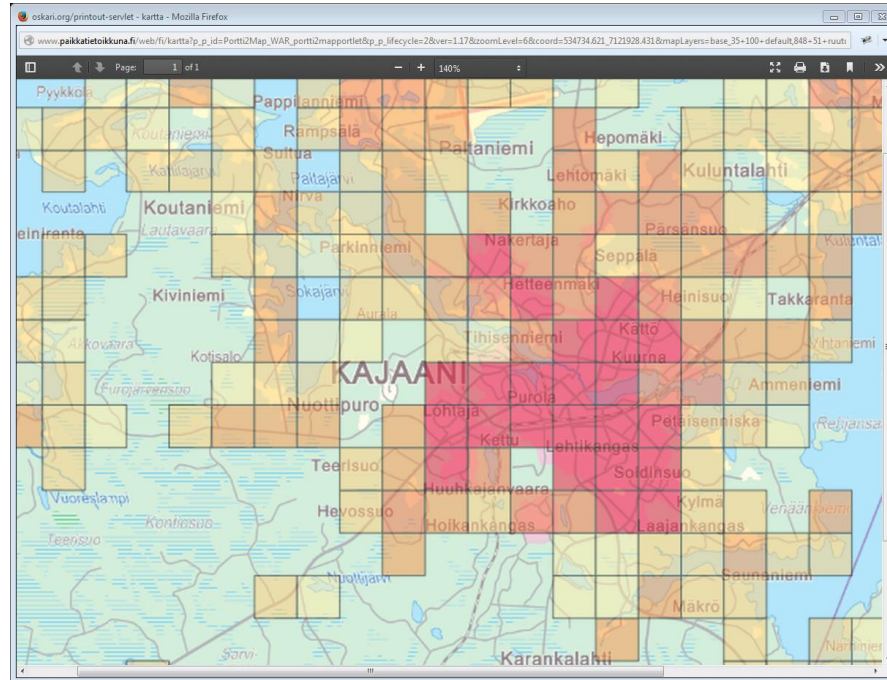
Finnish Transport Infrastructure Agency, Digiroad



- Roads and streets
- Addresses -> **geocoding**
- Speed limits, turning restrictions etc -> **routing**
- Bridges and tunnels
- Parking areas and houses
- Bus stops
- ...

- 1 x 1 km
- 2005, 2010-2018
- SHP

Statistics Finland, Population grid data



- 10 x 10 km
- 1961->
- TIFF, NetCDF

FMI



Average temperature



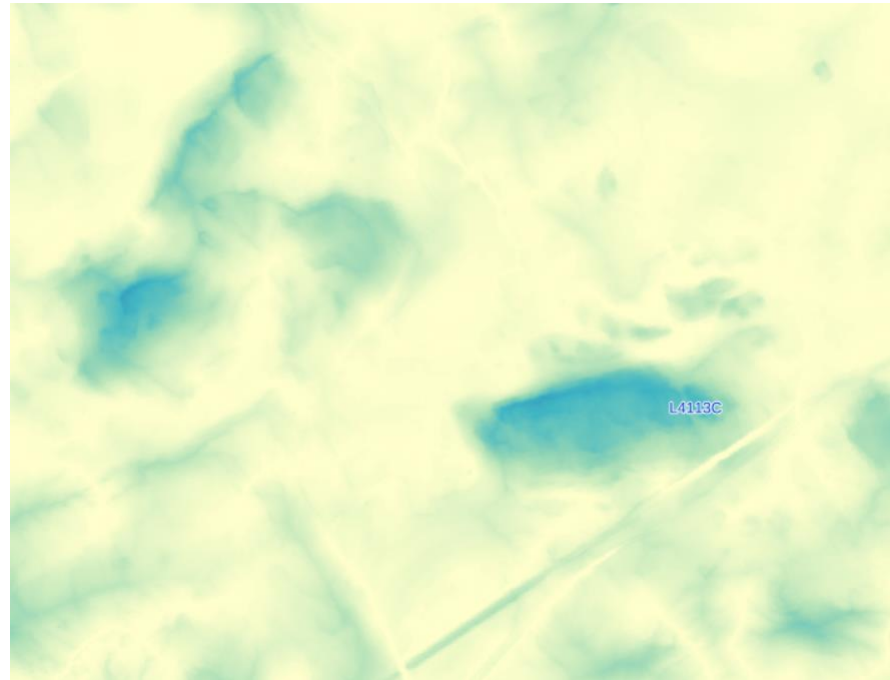
Precipitation



- Min and max temperature
- Air pressure
- Snow depth
- Relative humidity
- Radiation
- etc

- 2 x 2 m
- 2014-2019
- TIFF

LUKE, DTW-depth-to-water index map



Non-PaITuli data in Puhti

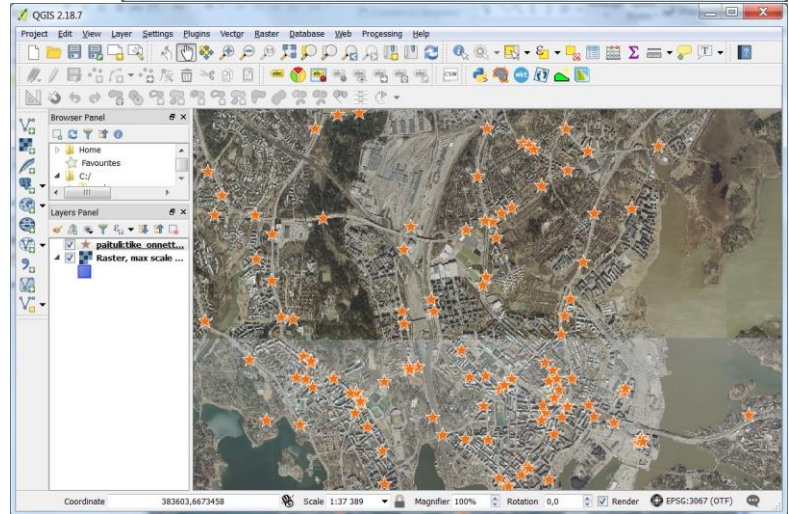
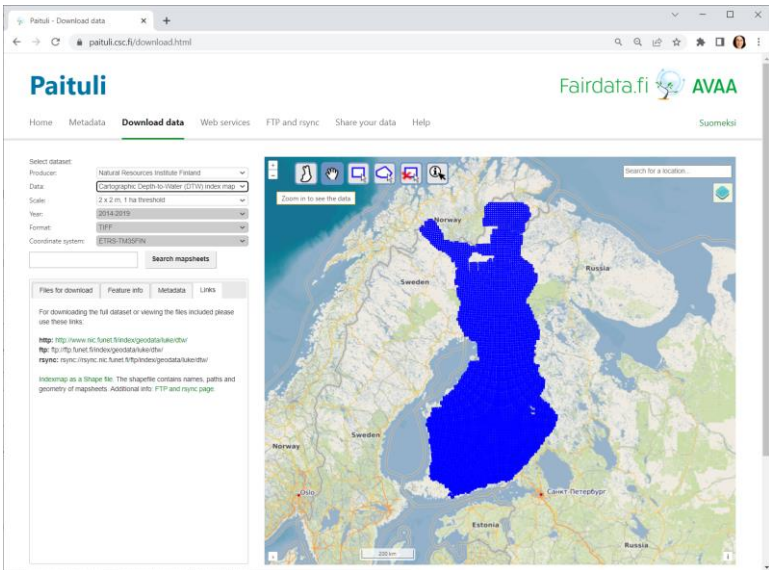
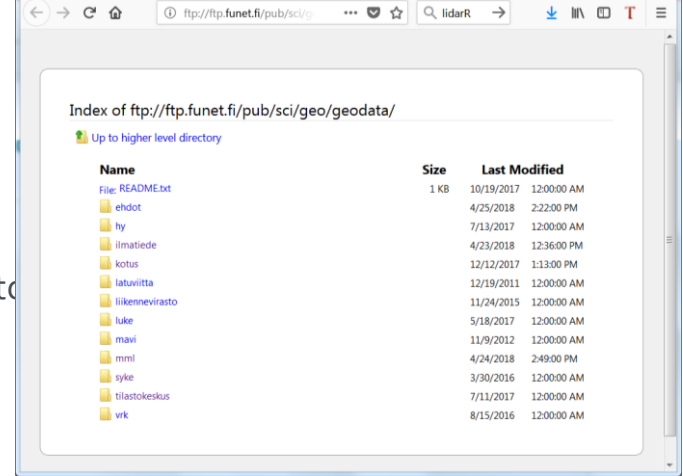
- LUKE, multi-source national forest inventory, 2013, 2015, 2017 and 2019.
- SYKE, All open spatial datasets available from [SYKE open data service](#).
- Finnish Forest Centre, [Canopy height model, 2021](#)
- Satellite mosaics produced by SYKE and FMI in Paikkatietoalusta project,
 - [Sentinel1 SAR mosaics](#): 10/2019 ->, 3 mosaics per month
 - [Sentinel2 index mosaics](#): 2018 ->, 2 mosaics per month, only during vegetation period, NDVI, NDBI, NDMI, NDTI, META.
 - [Historical Landsat satellite image mosaics](#): 1985, 1990, 1995
 - [Historical Landsat NDVI mosaics: 1984-2011](#)

Data access

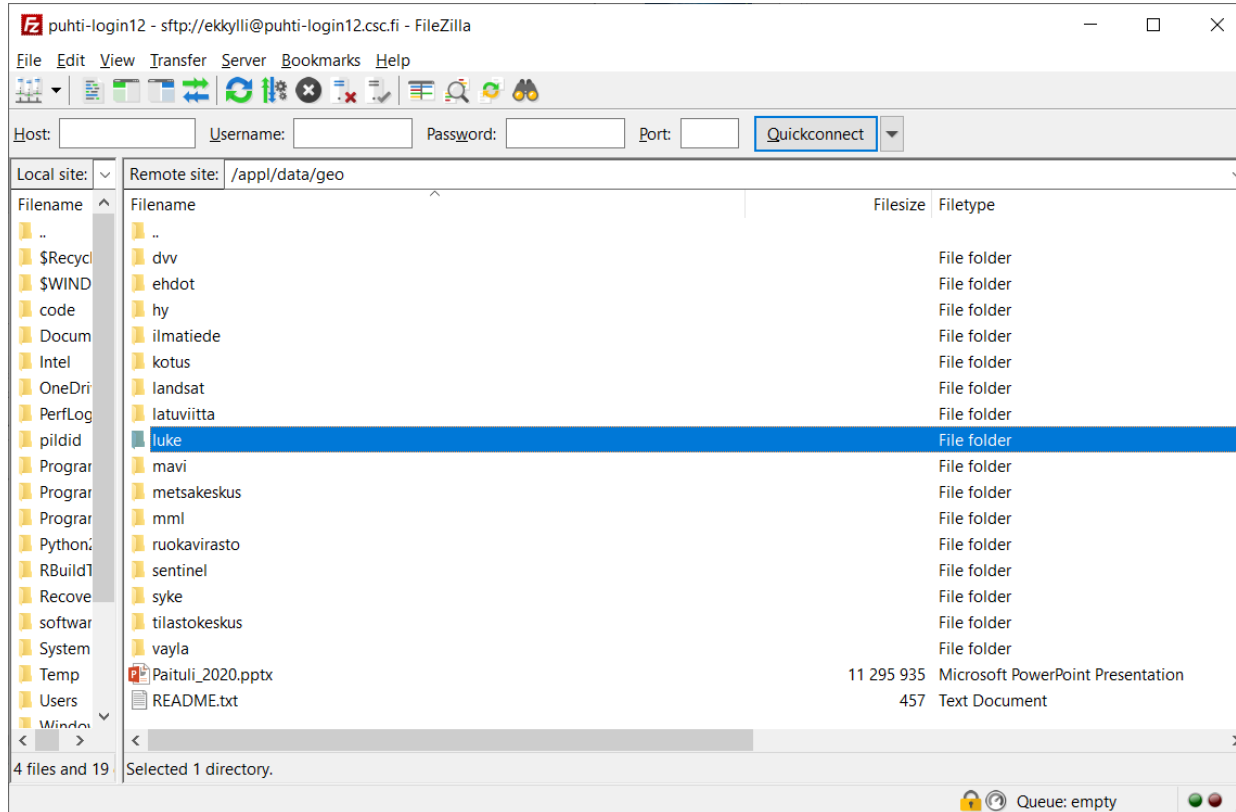


Paituli download / usage options

1. Files as zip from Paituli web service
2. APIs: WFS, WCS, WMS, WMTS, new OGC APIs
3. Files batch download - https/ftp/rsync: curl, wget, Python, R etc
4. Puhti



Paituli files in Puhti supercomputer



puhti-login12 - sftp://ekkylili@puhti-login12.csc.fi - FileZilla

File Edit View Transfer Server Bookmarks Help

Host: Username: Password: Port: Quickconnect

Local site: Remote site: /appl/data/geo

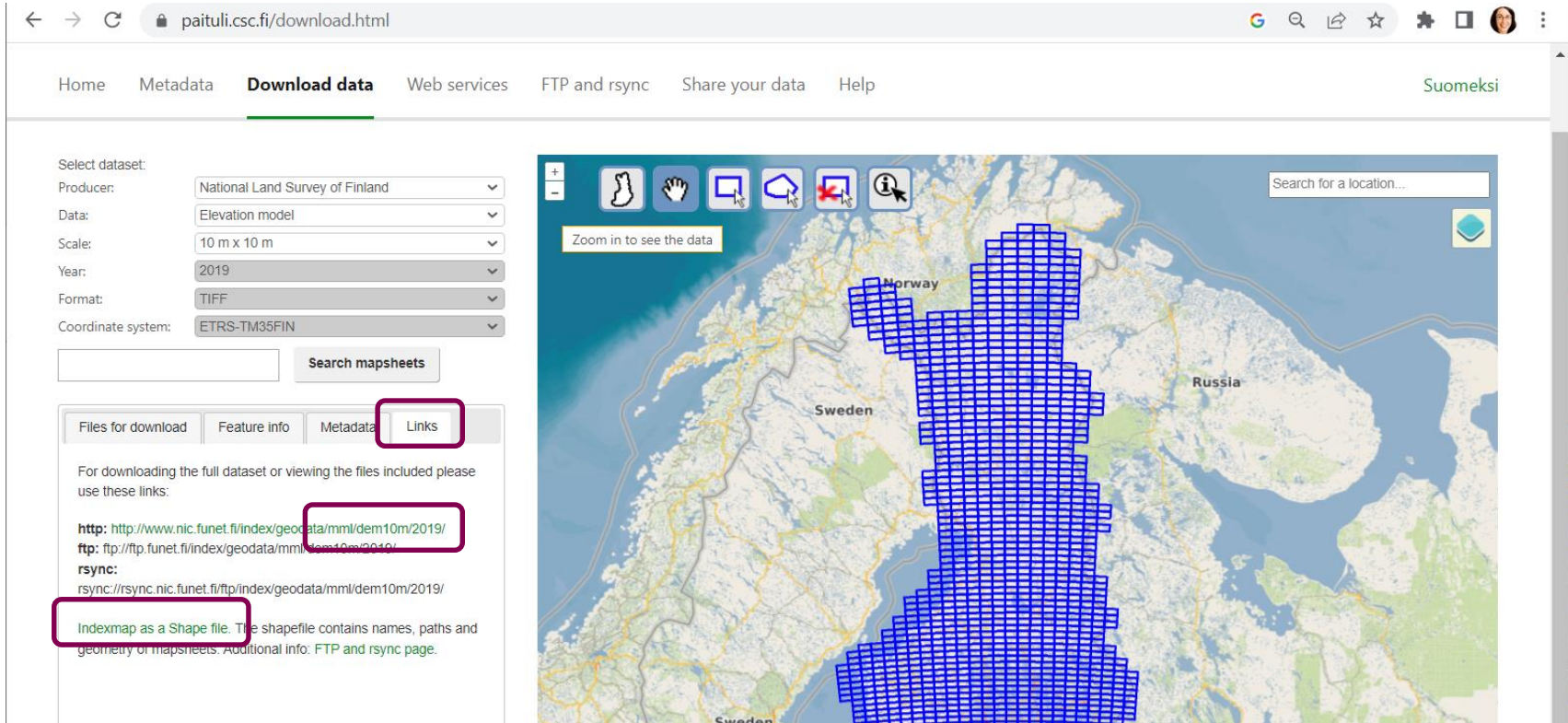
Filename	Filename	Filesize	Filetype
..	..		
\$Recycl	dvv		File folder
\$WIND	ehdot		File folder
code	hy		File folder
Docum	ilmatiede		File folder
Intel	kotus		File folder
OneDri	landsat		File folder
PerfLog	latuviitta		File folder
pildid	luke		File folder
Prograr	mavi		File folder
Prograr	metsakeskus		File folder
Prograr	mml		File folder
Python:	ruokavirasto		File folder
RBuildT	sentinel		File folder
Recove	syke		File folder
softwar	tilastokeskus		File folder
System	vayla		File folder
Temp	Paituli_2020.pptx	11 295 935	Microsoft PowerPoint Presentation
Users	README.txt	457	Text Document

4 files and 19 Selected 1 directory.

Queue: empty

<https://docs.csc.fi/data/datasets/spatial-data-in-csc-computing-env/#spatial-data-in-puhti>

How to find the file path in Puhti? /appl/data/geo



The screenshot shows the Puhti web application interface. The browser address bar displays `paituli.csc.fi/download.html`. The navigation menu includes **Home**, **Metadata**, **Download data** (highlighted), **Web services**, **FTP and rsync**, **Share your data**, and **Help**. The user's name, **Suomeksi**, is visible in the top right corner.

On the left side, the "Select dataset:" section contains the following configuration:

- Producer: National Land Survey of Finland
- Data: Elevation model
- Scale: 10 m x 10 m
- Year: 2019
- Format: TIFF
- Coordinate system: ETRS-TM35FIN

Below the configuration is a "Search mapsheets" button and a search input field.

The "Files for download" tab is active, showing a list of download links. The "Links" sub-tab is highlighted. The text below the links reads: "For downloading the full dataset or viewing the files included please use these links:"

- http:** <http://www.nic.funet.fi/index/geodata/mml/dem10m/2019/>
- ftp:** <ftp://ftp.funet.fi/index/geodata/mml/dem10m/2019/>
- rsync:** <rsync://rsync.nic.funet.fi/ftp/index/geodata/mml/dem10m/2019/>

A link labeled "Indexmap as a Shapefile" is also present, with a note: "The shapefile contains names, paths and geometry of mapsheets. Additional info: [FTP and rsync page](#)."

On the right side, a map of the region around Sweden, Norway, and Russia is displayed. A blue grid of map sheets is overlaid on the landmass. A tooltip above the grid says "Zoom in to see the data". The map interface includes standard navigation controls (home, pan, zoom, etc.) and a search bar labeled "Search for a location...".

Virtual rasters for big raster datasets

- Originally GDAL concept, works with many GDAL-based tools, inc R and Python.
- Use not overlapping map sheets as if they would be one big file.
- Technically small XML-file .vrt that refers to actual data files.
- <https://docs.csc.fi/support/tutorials/gis/virtual-rasters/>
 - Code examples for GDAL commandline tools, R raster/terra and Python rasterio.
- Used in:
 - Puhti NLS DEMs and infrared orthophotos:
<https://docs.csc.fi/data/datasets/spatial-data-in-csc-computing-env/#puhti-virtual-rasters>
 - GeoPortti GeoCubes
 - FMI STAC for some datasets

Virtual drivers = reading data directly from URL

- Originally GDAL concept, works with many GDAL-based tools, inc R and Python.
- **VSICURL**, any URL, usually public URLs, but also credentials possible
- https://gdal.org/user/virtual_file_systems.html#vsicurl-http-https-ftp-files-random-access
- Examples:

GeoCubes DEM10 VRT in cPouta:

```
gdalinfo /vsicurl/https://vm0160.kaj.pouta.csc.fi/mml/korkeusmalli/km10/2018/km10_2018_10m.vrt
```

Sentinel2 one file in Allas:

```
gdalinfo /vsicurl/https://a3s.fi/Sentinel2-MSIL2A-cloud-0-95-2016-T34VDN  
/S2A_MSIL2A_20160516T100032_No202_R122_T34VDN_20160516T100032.SAFE/GRANULE/L2A_T34V  
DN_A004695_20160516T100032/IMG_DATA/R10m/L2A_T34VDN_20160516T100032_B02_10m.jp2
```

Virtual drivers = reading data directly from S3 (Allas)

- **VSIS3**, S3 object storage, for example AWS or CSC Allas:
- Requires setting up credentials and S3-endpoint
- https://gdal.org/user/virtual_file_systems.html#vsi3-aws-s3-files
- <https://docs.csc.fi/apps/gdal/#using-files-directly-from-allas>
- Examples:

Sentinel2 one file in Allas :

```
gdalinfo /vsi3/Sentinel2-MSIL2A-cloud-0-95-2016-T34VDN  
/S2A_MSIL2A_20160516T100032_N0202_R122_T34VDN_20160516T100032.SAFE/GRANULE/L2A_T34VD  
N_A004695_20160516T100032/IMG_DATA/R10m/L2A_T34VDN_20160516T100032_B02_10m.jp2
```