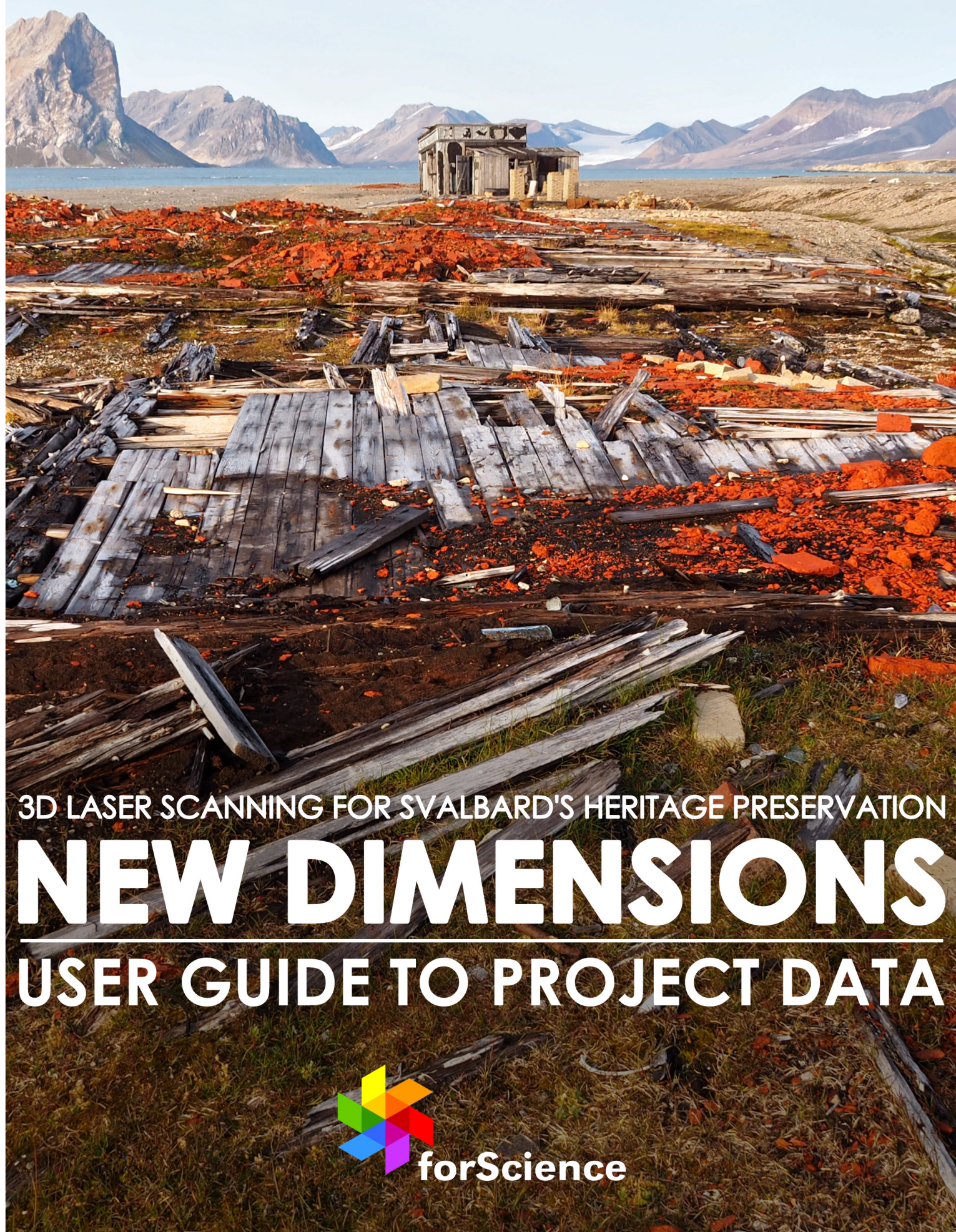




3D LASER SCANNING FOR SVALBARD'S HERITAGE PRESERVATION

NEW DIMENSIONS

USER GUIDE TO PROJECT DATA



forScience

1. PROJECT OVERVIEW	1
★ Purpose	1
★ Geographical focus	1
★ Approach	2
★ Outcome	2
2. PROJECT DATA OVERVIEW	2
★ Online data access	2
★ Data structure	2
★ Naming convention	5
★ Licence	6
3. NEW DIMENSIONS DATA TYPE DETAILS	6
I. New Dimensions Cultural Heritage Catalogue	6
II. GIS files	6
III. Digital photographs	7
IV. Orthophotographs	8
V. Terrestrial laser scans	9
6. SUPPLEMENTARY PROJECT DATA INFORMATION	9
★ Digital object identifiers (DOIs)	9
★ Updates	10
★ Contact & support	10

1. PROJECT OVERVIEW

★ Purpose

Although Svalbard is most readily associated with outstanding natural beauty, its cultural heritage is just as unique. The archipelago boasts an exceptional concentration of international, non-indigenous cultural monuments spanning 400 years and ranging from early 17th-century whaling stations to post-war mining infrastructure. Many of these sites, however, have not been surveyed for decades, which means that the existing documentation is incomplete and outdated. The purpose of the New Dimensions project, conceived and carried out by the forScience Foundation, was to fill the existing knowledge gaps regarding the sites' exact location and current condition by producing thorough, accurate documentation of selected cultural monuments within the project's target area.

★ Geographical focus

The New Dimensions project focused on the southern part of Spitsbergen, specifically the Wedel Jarlsberg Land from Storvika southwards and the whole of Sørkappland.

★ Approach

To document the monuments, the forScience team employed a combination of terrestrial laser scanning with high-resolution ground-based and low-altitude digital photography. This integrated approach provided an accurate visual and spatial record while ensuring no disturbance to protected sites, structures or objects. Project fieldwork was based on data from [the GEONORGE cultural heritage catalogue](#), supplemented with information from a range of academic publications.

<https://kartkatalog.geonorge.no/nedlasting>

★ Outcome

The project resulted in a comprehensive set of data on Svalbard's cultural heritage in southern Spitsbergen. The visual and spatial records are complemented with brief descriptions of the monuments and their environmental context, as well as – whenever possible – additional information from published sources. Moreover, the New Dimensions project website was created that puts the cultural heritage of Svalbard into a broader context and presents it in a manner appropriate for non-scientific audiences. The website is available in two language versions – English and Polish.

<https://forscience.pl/new-dimensions-en>

<https://forscience.pl/new-dimensions-pl>

2. PROJECT DATA OVERVIEW

★ Online data access

The data collected under the New Dimensions project has been assessed, processed and curated into a comprehensive collection of datasets made digitally available through [the Polish Polar DataBase POLAR-PL](#), part of [the CENAGIS IT platform](#). POLAR-PL is registered in [re3data.org](#) – an international registry of trusted research data repositories, which ensures long-term accessibility and compliance with recognised standards for research data management.

<https://polar.cenagis.edu.pl>

Accessing the New Dimensions project data does not require a user login. The datasets can be located in the database in several ways:

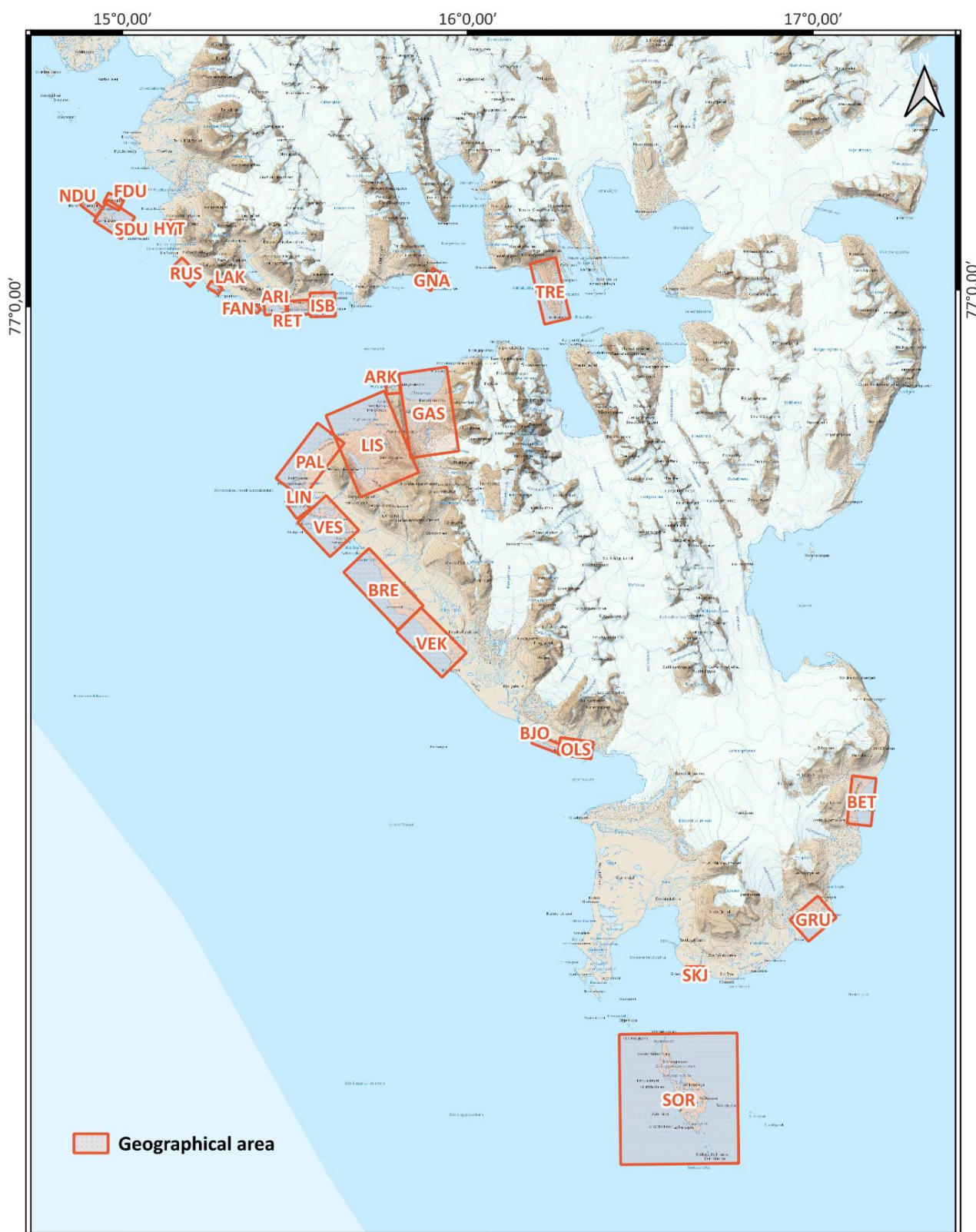
From the home page: enter *New Dimensions* in the search bar.

From the Organisations tab: select *forScience Foundation* or use the search bar to find it.

From the Groups tab: select *New Dimensions* or use the search bar to find it.

★ Data structure

To avoid potential confusion caused by the sheer amount of project data, twenty-six general geographical areas were distinguished within the New Dimensions project's overall target area, each with a unique three-letter code. Every one of the 218 documented cultural monuments is located within one of these areas and it is the areas that provide the basis for how the data is structured and named, with the unique area codes used consistently across all datasets and data types.



Target area of the New Dimensions project.

Distinguished within it are twenty-six general geographical areas, each provided with a three-letter code used to systematically arrange project data.

Map data © [Norwegian Polar Institute](#)

The three-letter area codes are as follows:

ARI	Ariebukta	LIN	Lindqvistbukta
ARK	Arkeologvika	LIS	Lisbetdalen
BET	Bettybukta	NDU	Nordre Dunøya, Dunøyane
BJO	Bjørnbeinflya	OLS	Olsokflya & Stormbukta
BRE	Breineset	PAL	Palffyodden
FAN	Fangstmannpynten	RET	Rettkvalneset & Rettkvalbogen
FDU	Fjørholmen, Dunøyane	RUS	Russepynten
GAS	Gåshamna	SDU	Store Dunøya, Dunøyane
GNA	Gnålodden	SKJ	Skjemmeneset
GRU	Grunnvågsletta & Grunnvågen	SOR	Sørkappøya
HYT	Hyttevika	TRE	Treskelen
ISB	Isbjørnhamna & Wilczekodden	VEK	Vektaren
LAK	Låkpynten	VES	Vestvika

For each of the above geographical areas, an individual dataset has been created, and within each dataset, separate data subsets are provided for every monument located in the area, compressed into ZIP files for easy download. This approach allows users to navigate the New Dimensions project data effectively and to easily identify all data relevant to a specific area or monument.

In addition to the area-based datasets, there is a separate dataset – New Dimensions Catalogue – which contains the New Dimensions Cultural Heritage Catalogue in .xlsx format, a copy of it in .pdf (for users without the required software), and GIS files showing the location of the twenty-six geographical areas and the exact location of all documented monuments.

The range of data available for each cultural monument varies according to the monument's character and the weather conditions during fieldwork. All monuments were assigned GPS coordinates and photo-documented, although the number of images differs from site to site. Low-altitude photographs and orthophotographs were only taken under suitable weather conditions, which is to say – when there was sufficient light and no wind, fog or precipitation. Likewise, terrestrial laser scans were carried out only when the weather allowed (no fog or precipitation) and only for larger structures, such as standing cabins or cabin ruins. For every monument, supporting notes were taken on site, and extra information from published sources was added when available. Consequently, the minimum data subset for any given monument consists of GPS coordinates, at least one photograph and supporting notes, whereas the full data subset – available only for a limited number of monuments – includes multiple ground-based and low-altitude photographs, orthophotographs, terrestrial laser scans as well as supporting notes and additional contextual information.

The New Dimensions project data includes the following data types:

I. Cultural Heritage Catalogue	.xlsx	Master Excel document containing a full list of documented monuments, incl. identification codes, GPS coordinates, overview of available visual and spatial data, supporting notes, environmental context and additional information
II. GIS files	.gpkg	GeoPackage comprising geographically referenced spatial data on the general geographical areas (polygons) and individual cultural monuments (points)
III. Digital photographs	.jpg	Labelled ground-based and low-altitude digital photographs depicting individual monuments and their immediate surroundings
IV. Orthophotographs	.tif	GeoTIFF files providing visual aerial data with embedded geographic metadata
V. Terrestrial laser scans	.las	Point clouds representing the scanned objects and their environment, shared along with corresponding panoramic photos and measurement accuracy reports

★ Naming convention

All files across the individual datasets – photographs, orthophotographs and terrestrial laser scans – follow a unified naming convention. Each file name begins with the Foundation's name (forScience), followed by a three-letter area code (XXX). In the case of photographs, this is invariably followed by the specific monument identification code (MonID). For orthophotographs and terrestrial laser scans, data type codes (ORTHO or TLS, respectively) are given in the file name before the monument code. Orthophotograph file names may lack the monument code if they cover an area in which more than one monument is located. The final double digit (ZZ) is the file's number, included in the file name when more than one file of the same type exists for a given area and monument.

This standardized approach to naming dataset elements ensures that files associated with a particular cultural monument or geographical area can be easily identified and retrieved, regardless of their format.

Example file name:

digital photograph: forScience_XXX_MonID_ZZ

orthophotograph: forScience_XXX_ORTHO_MonID or forScience_XXX_ORTHO_ZZ

terrestrial laser scan: forScience_XXX_TLS_MonID_ZZ

★ Licence

All data produced by the forScience Foundation as part of the New Dimensions project is released under the **Creative Commons Attribution-NonCommercial-NoDerivatives (CC BY-NC-ND)** licence. This means users are free to download and share the material, provided they give appropriate credit to the forScience Foundation and the project. The data may not be used for commercial purposes, and no modifications, adaptations, or derivative works may be made from it. Any reuse must therefore preserve the original form of the data and include full attribution.

If users wish to employ the material in ways not permitted by this licence, they are welcome to contact the forScience Foundation to discuss possible alternative permissions or licensing agreements.

3. NEW DIMENSIONS DATA TYPE DETAILS

I. New Dimensions Cultural Heritage Catalogue

The New Dimensions Cultural Heritage Catalogue is the project's key output that provides a comprehensive overview of 218 documented cultural monuments. For each monument, it includes the identification code, general geographical area, exact coordinates (GPS), date of survey completion, and a full list of available visual and spatial data – referenced through the photograph, orthophotograph and terrestrial laser scan file names. Each entry also contains a representative photograph, brief supporting notes based on on-site observations, a short description of the monument's environmental context, and – when available – additional contextual information drawn from published sources.

By linking directly to all relevant data, the New Dimensions Cultural Heritage Catalogue serves as an essential navigation tool, enabling users to quickly determine what material is available for each monument and to move easily between general geographic areas and specific sites. It is important to note that the Catalogue is not designed to function as a stand-alone resource. Rather, it forms part of an integrated whole together with the associated data to which it refers.

In addition, the Catalogue includes two supplementary tabs. One provides an overview of errors identified in the GEONORGE cultural heritage records, primarily incorrect site locations. The other contains a list of all publications directly referred to in the main worksheet, allowing users to easily trace the sources of additional information.

File format: .xlsx (.pdf)

Software requirements: MS Excel 2024 or Microsoft 365 (Acrobat Reader or another PDF viewer)

Licence: CC BY-NC-ND

II. GIS files

The location of all documented elements of Svalbard's cultural heritage was recorded using GARMIN GPS 62s and 65s handheld receivers. Depending on ionospheric conditions, space weather, and local environmental factors during fieldwork, positional accuracy typically ranged between 2 and 10 m. This level of precision is sufficient to reliably locate the cultural monuments in the field.

The New Dimensions project data includes two shapefile (.shp) vector data layers in the EPSG:4326 (WGS84) coordinate reference system:

4. **NewDimensions_heritage_sites.shp** – point data representing the recorded locations of cultural monuments,
5. **NewDimensions_study_areas.shp** – polygon data delineating the twenty-six general geographical areas distinguished within the New Dimensions project's overall target area.

Because each shapefile consists of multiple component files, both layers have been consolidated into a single GeoPackage (.gpkg) for convenience. The GeoPackage is compatible with any standard GIS software.

Authorship: Adam Nawrot, forScience Foundation

File format: .gpkg (GeoPackage)

Software requirements: QGIS (open software), ArcGIS or other GIS software

Licence: CC BY-NC-ND

III. Digital photographs

The New Dimensions photographs are a curated selection of the most representative ground-based and low-altitude images for each documented cultural monument, totalling 878 photographs across the entire project area. The primary purpose of this data type is to provide clear visual documentation of each monument, offering information that is often more precise and less open to misinterpretation than verbal description alone.

All photographs share a standard resolution of 3240 x 2160 pixels, which keeps file sizes manageable while preserving sufficient image quality. To ensure that essential information is not lost when photographs are renamed or metadata removed, each photograph includes an embedded text panel containing the project's name, RiS ID, basic credit information, site coordinates and capture date, while the cultural monument visible in the photograph is tagged with its identification code. When multiple monuments appear in a single photograph, the coordinates in the text panel correspond to the main monument (the one indicated in the original file name). Additional monuments are tagged to give users a better understanding on the monuments' location in relation to each other. If two or more monuments lie in close proximity, similar images may be given for different monuments, especially in the case of low-altitude photographs. Should this cause confusion, users are encouraged to review the remaining photographs and the monument's entry in the New Dimensions Cultural Heritage Catalogue.

As is the case with all project data types, the digital photographs are organized into sets according to geographical area and cultural monument, and compressed into ZIP files for easy download. Additionally, to give users an opportunity to preview the monuments included in a given dataset without having to download large ZIP files, a single representative photograph of each monument is provided.

Users who require higher resolution images, complete EXIF metadata, or who wish to use the photographs in ways not permitted under the CC BY-NC-ND licence are welcome to contact the forScience Foundation to discuss alternative arrangements.

Authorship: Barbara Józwiak, forScience Foundation (ground-based photographs) & Adam Nawrot, forScience Foundation (low-altitude photographs)

File format: .jpg

Software requirements: IrfanView or another photo viewer

Licence: CC BY-NC-ND

IV. Orthophotographs

To complement the spatial and numerical data collected during project fieldwork, orthophotographs were produced for all areas where this was feasible and warranted. Orthophotographs are geometrically corrected aerial raster images in which distortions caused by terrain relief and camera tilt have been removed, ensuring that each pixel is spatially accurate and georeferenced. This allows, for example, for precise measurement of objects located within a given heritage site and facilitates the identification of features that may be difficult or impossible to detect from ground level.

Covering a substantially larger area than ground-based photographs, orthophotographs also provide a broader view of each monument's environmental context. As a result, they are a valuable tool for monitoring changes over time and identifying processes that may pose risks to the long-term preservation of cultural monuments.

In 2023, orthophotographs were acquired using an Autel Evo II Pro 6K UAV operating without real-time kinematic (RTK) positioning. From 2024 onwards, the equipment used for the purpose was a DJI Mavic 3 Enterprise RTK with a DJI GNSS D-RTK 3 base station, which improved positional accuracy to approximately 1 cm. All orthophotographs are georeferenced in the EPSG:4326 (WGS84) coordinate reference system.

The orthophotographs were generated from hundreds of overlapping aerial images captured during the New Dimensions project fieldwork. Depending on weather conditions and site characteristics, UAV flights were conducted at altitudes between 30 and 80 m above ground level, resulting in a ground sampling distance of 0.6–2.0 cm per pixel.

To take full advantage of the spatial information embedded in the orthophotographs, users should open the files in GIS software, which enables processing, analysis and visualisation of georeferenced raster data. Although the GeoTIFF files can also be viewed with standard image-viewing software, they will in that case appear as ordinary .tiff images with no spatial information.

Authorship: Adam Nawrot, forScience Foundation

File format: .tif (GeoTiff)

Software requirements: QGIS, ArcGIS or other GIS software

Licence: CC BY-NC-ND

V. Terrestrial laser scans

Terrestrial laser scanning (TLS) was employed in the New Dimensions project to obtain highly accurate spatial information of the form and position of selected cultural monuments. Measurements were conducted at ground level from multiple scan positions around the monument and – if possible – also from within the structure. TLS targets were used in the process to enable precise alignment of individual point clouds.

Scans were acquired for twenty-four monuments, primarily standing cabins and cabin ruins, using a Z+F IMAGER 5016 terrestrial laser scanner. Due to adverse weather conditions during project fieldwork, more objects could not be scanned.

The primary TLS output consists of high-resolution 3D point clouds, pre-processed and saved in the open LIDAR data exchange format (.las), with a separate file produced for each scan position. All point clouds are georeferenced using the Universal Transverse Mercator (UTM) Zone 33N coordinate reference system. Apart from the point clouds, the scanning data also includes panoramic photographs and measurement accuracy reports, all of which are made available in monument-specific data subsets.

Authorship: Artur Adamek, [Skala 3D](#) & Igor Wronkowski

File format: .las

Software requirements: CloudCompare, QGIS or any other software that reads .las files

Licence: CC BY-NC-ND

6. SUPPLEMENTARY PROJECT DATA INFORMATION

★ Digital object identifiers (DOIs)

Each of the New Dimensions datasets has been assigned a unique digital object identifier (DOI) to ensure reliable, permanent referencing. When using or citing any part of the project data, users are strongly encouraged to refer to the specific datasets via their DOIs. Doing so guarantees that the referenced resource can be accurately identified, accessed and verified by others. It also supports good research practice and long-term data traceability. The full list of DOIs is provided below:

Dataset name	Digital Object Identifier (DOI)
New Dimensions – CATALOGUE	doi.org/10.48459/npfr-p167
New Dimensions – ARIEBUKTA, Svalbard	doi.org/10.48459/bnqe-yv67
New Dimensions – ARKEOLOGVIKA, Svalbard	doi.org/10.48459/k34e-tt91
New Dimensions – BETTYBUKTA, Svalbard	doi.org/10.48459/bsca-pq53
New Dimensions – BJØRNBEINFLYA, Svalbard	doi.org/10.48459/xj2z-ng51
New Dimensions – BREINESET, Svalbard	doi.org/10.48459/2g4q-fe68
New Dimensions – FANGSTMANNPYNTEN, Svalbard	doi.org/10.48459/dg66-j519
New Dimensions – FJØRHOLMEN, DUNØYANE, Svalbard	doi.org/10.48459/7r2z-br68

New Dimensions – GNÅLODDEN, Svalbard	doi.org/10.48459/th8a-e326
New Dimensions – GRUNNVÅGEN, Svalbard	doi.org/10.48459/e69c-xq31
New Dimensions – GÅSHAMNA, Svalbard	doi.org/10.48459/6pkp-4m54
New Dimensions – HYTTEVIKA, Svalbard	doi.org/10.48459/ww6x-d251
New Dimensions – ISBJØRNHAMNA, Svalbard	doi.org/10.48459/q2sq-xe42
New Dimensions – LINDQVISTBUKTA, Svalbard	doi.org/10.48459/ns7z-p875
New Dimensions – LISBETDALEN, Svalbard	doi.org/10.48459/6xsy-y691
New Dimensions – LÅKPYNTEEN, Svalbard	doi.org/10.48459/tzjt-bn90
New Dimensions – NORDRE DUNØYA, DUNØYANE, Svalbard	doi.org/10.48459/4xsx-p154
New Dimensions – OLSOKFLYA, Svalbard	doi.org/10.48459/z6r0-9h72
New Dimensions – PALFFYODDEN, Svalbard	doi.org/10.48459/x2zn-8w81
New Dimensions – RETTKVALBOGEN, Svalbard	doi.org/10.48459/z3gv-nz43
New Dimensions – RUSSEPYNTEEN, Svalbard	doi.org/10.48459/mg1h-vn07
New Dimensions – SKJEMMENESSET, Svalbard	doi.org/10.48459/qxf0-3c06
New Dimensions – STORE DUNØYA, DUNØYANE, Svalbard	doi.org/10.48459/4df9-re95
New Dimensions – SØRKAPPØYA, Svalbard	doi.org/10.48459/1mjg-6z74
New Dimensions – TRESKELEN, Svalbard	doi.org/10.48459/jetz-gp69
New Dimensions – VEKTAREN, Svalbard	doi.org/10.48459/j41r-nc68
New Dimensions – VESTVIKA, Svalbard	doi.org/10.48459/0k0j-pa33

★ Updates

Although the project has been formally completed, the forScience Foundation is planning to maintain the New Dimensions Cultural Heritage Catalogue as a living document. This means that if new monuments are identified during future fieldwork or related projects, the Catalogue and the datasets will be updated. Each time this happens, the version number on the Catalogue will be revised and a summary of changes will be included in the project description in the database.

★ Contact & support

If you have questions about the User Guide or the New Dimensions project data, or wish to seek permission to use them under different licence terms, please contact the forScience Foundation. We also welcome your feedback if you notice errors or would like to suggest updates or improvements to the Catalogue or the associated datasets.



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In case of any difficulties accessing the New Dimensions project data through the Polish Polar DataBase (POLAR-PL), you are encouraged to contact POLAR-PL Data Stewards for assistance. Their contact details are available in [the About section of the POLAR-PL website](#).

Barbara Józwiak and Adam Nawrot
NEW DIMENSIONS User Guide to Project Data

cover photographs | Barbara Józwiak

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