MONITORING REPOSITORY

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Author: Ronny Klæboe (TOI)

MOVE21 – Multimodal and interconnected hubs for freight and passenger transport contributing to a zero emission 21st century

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Legal Disclaimer

Project Executive Summary

The main objective of MOVE 21 is to transform European cities and functional urban areas into climate neutral, connected multimodal urban nodes for smart and clean mobility and logistics. MOVE21 will do this through an integrated approach in which all urban systems are connected, and which addresses both goods and passenger transport together. As a result, MOVE21 will improve efficiency, capacity utilisation, accessibility and innovation capacity in urban nodes and functional urban areas.

The integrated approach in MOVE21 ensures that potential negative effects from applying zero emission solutions in one domain are not transferred to other domains but are instead mitigated. It also ensures that European transport systems will become more resilient. Central to the integrated approach of MOVE21 are three Living Labs in Oslo, Gothenburg, and Hamburg and three replicator cities Munich, Bologna and Rome. In these, different types of mobility hubs and associated innovations are tested and means to overcome barriers for clean and smart mobility are deployed. The Living Labs are based on an open innovation model with quadruple helix partners. The cocreation processes are supported by coherent policy measures and by increasing innovation capacity in city governments and local ecosystems. The proposed solutions deliver new, close to market ready solutions that have been proven to work in different regulatory and governance settings. The Living Labs are designed to outlast MOVE21 by applying a self-sustaining partnership model.

MOVE21 partners

The MOVE21 consortium consists of 24 partners from seven different European countries, representing local city authorities, regional authorities, technology and service providers, public transport companies, SMEs, research institutions, universities and network organisations.

- **Norway**: City of Oslo, Viken County, Ruter, Urban Sharing, Mixmove, Institute of Transport Economics, IKT-Norge
- **Sweden**: City of Gothenburg, Rise Research Institutes of Sweden, Business Region Gothenburg, Volvo Technology, Renova, Parkering Göteborg
- **Germany**: City of Hamburg, City of Munich, Hafencity University Hamburg, Deutsche Bahn Station & Service
- **Italy**: Metropolitan City of Bologna, Roma Servizi per la Mobilità, Roma Tre University
- **Belgium**: Eurocities, Polis
- **The Netherlands**: TNO
- **Greece**: Hellas Centre for Technology and Research

https://twitter.com/move21eu

https://www.linkedin.com/company/74707535/

For further information please visit **www.move21.eu**

Executive summary

Key words

Project status, progress tracking, dataset retrieval

UMMS Description and initial User Manual

This report is an accompanying document to the submission of Deliverable 8.2 which is the web application **Urban Mobility Monitoring System (UMMS)** hosted at https://move21.no. The **UMMS** web application is used to track datasets, document progress, and manage KPIs for innovative mobility solutions in MOVE21 Living Lab, replicator, and cascading city areas. The purpose of the **UMMS** is defined under WP 8:

> *D8.2: Monitoring Repository. This deliverable is an evaluation and monitoring data repository. The repository will be structured following the Expected Impact section 2.1 (filters; city, dataset; KPI, data linked, baseline - year, target - year).*

The **UMMS** supports rapid and easy access to the key performance indicators (KPIs) belonging to four Impact areas of MOVE21. It facilitates filtering according to geographic area, time periods, and value types (baselines, attainments, ex-ante, and ex-post values). The **UMMS** allows uploads and downloads of documents, attachment of links, and can apply procedures and tools for assessing progress, attainment percentages, and goal achievements after these have been defined and implemented.

This report includes the **initial** user manual of the **UMMS**. However, the **UMMS** is not static and will be built and incorporate changes as the MOVE21 urban innovation cases advances. The **UMMS** and also the **UMMS** website will be supplemented and amended as MOVE21 progresses. However, only the online user manual will be updated to reflect such changes and not this initial accompanying "launch" document.

Since there is a disparity between the scope of targets to be achieved, and the scope of individual innovation case impact results, the **UMMS** will also serve as repository for datasets and process documents used for extrapolating and harmonizing case study results. These additional intervening steps may prove necessary for ascertaining whether the set of case study achievements also imply that target values have been reached.

The information structure in the **UMMS** is dynamic and can be adapted to new innovation case studies, additional datasets and results, additional KPIs, as well as revisions to initially entered information. This makes it easier to revise the **UMMS** to reflect insights gained through the co-creation processes and work undertaken for deriving meaningful indicator values. The online version of the user manual will also benefit from user feedback and improvement suggestions.

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1 List of abbreviations and acronyms

Acronym	Meaning
B/C	Benefit Cost Ratio
CBA	Cost Benefit Analysis
DALY	Disability adjusted life years
DynEcon	Tool for dynamic cost benefit analysis
EC	European Commission
GHG	Green House Gases
KPI	Key Performance Indicator
UMMS	Urban Mobility Monitoring System
WP	Work Package

2 Purpose of the UMMS

The **Urban Mobility Monitoring System (UMMS)** is built for MOVE21 to monitor process progress, data collection efforts and KPIs under four impact areas. It should calculate improvements relative to initial baselines, compare attainments relative to target values and display degree of goal attainments for each of the innovative mobility solution projects launched in Living Lab City areas, as well as in replicator cities, and subsequently cascading city areas. The **UMMS** is implemented in the form of a web site, providing easy access to the key performance (KPIs) in four Impact areas. It allows uploading or linking datasets and results that become attached to each of the KPI**-Categories**. The **UMMS** has tools that allow relevant dependent indicators such as degree of progress and target attainment to be calculated.

2.1 Attainment of the objectives and explanation of deviations

The objectives related to this deliverable have been achieved in full and as scheduled. The website is hosted at https://move21.no.

2.2 Intended audience

The intended audience is project partners. All partners have status as co-operators and have access to the full site. The site is backed up frequently to allow recovery from possible but unlikely damaging user errors.

2.3 Structure of the deliverable and links with other work packages/deliverables

The deliverable is the **UMMS** website hosted at https://move21.no. The **UMMS** serves as a password protected common working platform for partners to uploading and downloading results and documents related to each of the city innovation cases and calculate relevant process, progress and KPI achievement figures. D8.2 is directly linked with D8.1 regarding the KPIs monitoring and calculations.

The 'Impact analysis framework for the Living Labs' is directly related to Task 8.2 under which **UMMS** will collect all data needed for the impact analysis (Task 8.3) and the calculation of some of the identified indicators. The **UMMS** is also related to WP3 'Urban Social Layer', WP4 'Governance Innovation' and WP5 'Technological Solutions and Integration', since it serves as a repository for the values relevant for the final list of indicators supporting the Integrated City Assessments, and the **UMMS** is consequently linked to D6.2, D6.3 and D6.4. WP2 describes all data that will be stored on the project workspace and that become linked by optional external links of **UMMS-Categories**, and data protection issues.

With respect to results from digital twin simulations and other calculations, it is envisioned that only a result document is uploaded for each of the runs, and indicator values updated on the basis of this result document. The document could be in .csv, excel or other formats.

The **UMMS** is a cooperative platform for the whole project, and WP6 could make use of it to hold information on Living Lab procedures, task force meetings etc. This is not part of the initial task description. However, coping with additional content will cause little problems after the more advanced process of hiding content selectively has been individualized, allowing different WPs to focus on different parts of the **UMMS-Category** hierarchies.

UMMS-Categories could be used to display diagrams, illustrations, or maps if this is desired and not too cumbersome to use. Providing progress and status indicators in the form of an information dashboard could provide a quick tool for assessing the status of different efforts and underpin focussed dissemination activities. However, other tools are available that could prove more convenient for this purpose.

This report contains the **initial** user manual for the **UMMS** and will not be updated. As the project develops updated versions of the user manual will be hosted on the site and can be downloaded from there.

3 UMMS User Manual

The **UMMS** is built to monitor progress of urban innovation cases for several groups of cities, provide an overview of co-creation processes, data collection efforts and KPIs from areas of impact There are many pieces of information to keep track of, and it is convenient to use a dynamic web-based system for entering and retrieving information. Since MOVE21 is an evolving project, the **UMMS** is not static, but needs to adapt to changes in the definition of use cases, KPIs, and evaluation criteria.

The ambition of the **UMMS** is to manage data needs and indicator sets for potentially a large number of innovation case studies and KPIs and keep track of cocreation efforts and processes. The **UMMS** should consequently allow upscaling of efforts while maintaining rapid retrieval of information and ease of updating.

3.1 **UMMS-Category** is the main information carrier

The basic multifaceted information carrier in the **UMMS** is named a **UMMS-Category**.

The strength of a **UMMS-Category** lies in that it mimics a

- **Folder: UMMS-Categories** have parents/children, and define hierarchical tree structures
- **Document: UMMS-Categories** contain rich text fields where text can be entered/pasted
- **Record: UMMS-Categories** may define named parameters with values
- **Container:** in that it can contain maps, images, uploaded files, and navigation links.
- **Variable:** in that that the visibility and content of a **UMMS-Category** may depend on other categories and their content

UMMS-Categories are presented on the home page (shown after successfully login in to the **UMMS**) in a similar fashion to folder and sub-folder hierarchies.

Figure 1: Sample web page with UMMS-Categories.

The **INDICATORS** root (or "top") **UMMS-Category** (See **Feil! Fant ikke referansekilden.**) has **Impact area 1, 2, 3** and **4** as children, and specific **KPIs** or groups of **KPIs** as grandchildren.

It is possible to hide or display different parts of the **UMMS-Category** structures, and parts of the **UMMS-Category** structure can be collapsed/expanded to hide/show underlying details. Dotted underlines indicate that some children are hidden and kept out of sight. Subsections can be in focus while other parts are kept hidden. This is convenient when one wishes to change the structure or add content without being disturbed by other parts of the **UMMS-Category** hierarchies that are irrelevant for this purpose.

3.2 UMMS uses a compact layout

A common presentation of the **INDICATORS** root **UMMS-Category** hierarchy could be as follows:

Figure 2: Folder hierarchy using vertical positioning and indents

This vertical layout has advantages when presenting a single root hierarchy without too many information levels and a limited number of items, However, the **UMMS** employs many context hierarchies at the same time. The **UMMS** should also scale up and therefore needs to adopt a more compact horizontal layout using a colour coding scheme instead of spacing to distinguish between information levels. The horizontal layout, multiple levels and rich functionality of **UMMS-Categories** allow a number of operations that multilevel, multiselect drop down menus or other selection mechanisms do not.

The background colour of the **UMMS-Categories** changes automatically to reflect their current information level. A root **UMMS-Category** (at level 1) has a black background (+name is capitalized), and its direct children (at level 2) have a red background and a sequence number composed of a "chapter" and "section" number. Since **2021** is the second **UMMS-Category** under the first root **UMMS-Category YEAR,** it gets the sequence number **1.2**.

3.3 Getting started and escaping

Use a modern browser on a PC, tablet or mobile to navigate to the **UMMS** website. The address is https://move21.no. Log in using your own e-mail address and password (provided separately). Bookmark the site for ease of revisiting. You will arrive at the home page. (See **Feil! Fant ikke referansekilden.**).

ESCAPING: By clicking on the Move21 Logo on the home page the **UMMS** will reload the home page and clear all selections and terminate current operations. Se upper left corner of Figure 1

To make hidden descendants visible see section 3.15
The **Logout** button is top right menu alternative on the home page See **Feil! Fant ikke referansekilden.** upper right corner.

3.4 Modifier buttons/keys

Some mouse commands such as **ctrl-double-click**[1] to collapse or expand a subtree require the simultaneous use of modifier keys. Since phones and tablets do not have modifier buttons, **ctrl**, **shift**, and **alt-key** modifiers can also be activated by tapping/touching or clicking **UMMS** modifier buttons in the footer.

Figure 3: Shift, Control and Alternate/Option ***UMMS*** *modifier buttons*

See Figure 3 where the ctrl-modifier button has been tapped, is currently active and highlighted

Tapping/touching or clicking modifier buttons is helpful as a work-around when some key-combinations are intercepted by the operating system or browser, and they are also convenient when taking notes/drinking coffee and having only one hand available to operate the **UMMS**

3.5 **UMMS-Category selections**

Click on a **UMMS-Category** to add it to a current selection. Selected categories (that are visible on current screen) are highlighted with a yellow name and narrow border. Click again to unselect. To check whether previously selected **UMMS-Categories** are still selected use the Info Page (Info icon in footer)

UMMS-Category ranges can be selected by shift-clicking. **Click** on first **UMMS-Category** and **shift-click**[2] the last to select a whole range. (A selected **UMMS-Category** remains selected even if you do not see it.

To unselect everything, click on the MOVE21 Logo in the upper left corner of the home page)

A selection is kept active even when it is hidden. This allows a user of the **UMMS** to delve deeply into a **UMMS-Category** hierarchy, find and select one or more keywords, collapse everything, then enter deeply into to a different **UMMS** hierarchy to select the next set of keywords. (Use info page if you need to check what is currently selected.)

3.6 Simple **UMMS-Category** search

Since it can be difficult to locate one **UMMS-Category** among many, a simple search facility is provided. From the first character that is entered in the footer search field the **UMMS** finds and selects categories having this character somewhere in its name. Entering “RO” will select Metro along with some other categories with “ro”. Upper or lower case does not matter.

[1] Ordinary **double-click** - without the ctrl-key - opens the category for editing
[2] Mobile/tablet: tap the modifier toolbar button for «shift» and then tap last category

The **UMMS-Category** name must be visible for the search to work. It may therefore become necessary to expand hidden descendants and use a high global display level to make everything visible (does not matter if this fills several screens since we will narrow down the visible alternatives when starting to use the search entry box.).

3.7 Entering/Editing content

New categories are usually entered as a sub-document to a parent **UMMS-Category**.

1. **Click** on the parent so that it is selected and
2. **press/tap** the down arrow key in the header toolbar (second button)
3. enter a value in the name/value field and pressing <Enter>

This procedure generates an empty child document that contains a link to its parent. (If you wish to create a top-level document that has no parent, use the menu alternative **Add root**.)

To be able to navigate back to this value, you need to be able to identify it by adding keywords. See Section 3.19 for how to do this manually.

After entering a value in the name/value field and pressing enter the **UMMS-Category** will obtain a number composed of the parent number where it is in the sequence of children. If the parent has the number 3.2.4, and its last child 3.2.4.3, the new entry will get the number 3.2.4.4. To promote the child – see section on rearranging content – drag the **UMMS-Category** on top of the sibling it should change place with.

Double-click an existing **UMMS-Category** to **Edit**

Special use of UMMS summary field
The summary text field content is displayed when hovering over a **UMMS-Category**. This user can thereby give more information about the content of the **UMMS** keyword or content category than is evident from just the **UMMS-Category** name itself.

It is sufficient to provide a name for the **UMMS-Category** for it to be created.

(Behind the scenes the **UMMS-Category** will also get a unique _id consisting of 24 hexadecimal numbers. When assigning parents or attaching keywords, it is this _id that is used behind the scenes. The use of a unique identifier avoids confusion when there are categories belonging to different parts of the **UMMS** having the same name, or old versions having been marked as deleted, but not physically removed from the system.)

The **UMMS-Category** contains a rich text field description that allows information to be simply pasted into it from Word or other sources. Since the rich text fields can contain a new line made by pressing **<ENTER>,** the **<ENTER>** key will not automatically submit the document. Use the **save and exi**t button or move to a normal field where the **<ENTER>** key will submit the document.

3.8 Entering of simple baseline, target, ex-ante, and ex-post values

In most cases WP8 or the data collection effort managers will specify where and how to upload data using the following procedures.

The **ENTRIES** “folder” is the default location to place new information items, but it is also possible that you will be instructed to use a subfolder of **ENTRIES** by the collection effort manager. It is also possible to distinguish not only between different data collection efforts but also between different parts of such efforts, phases or any combination thereof. E.g., Baselines could be put in an **ENTRIES** sub-folder: **ENTRIES>Baselines**[3].

3.8.1 Preparation:

a) Select **ENTRIES** (single click on it)
b) Locate the **pin** button in the footer and click on it (**ENTRIES** is now pinned and automatically becomes the parent folder for your submission).
c) Click on the right arrow in the footer to toggle between different types of status/rating indicators and select alternative with target symbol (=simple entry)

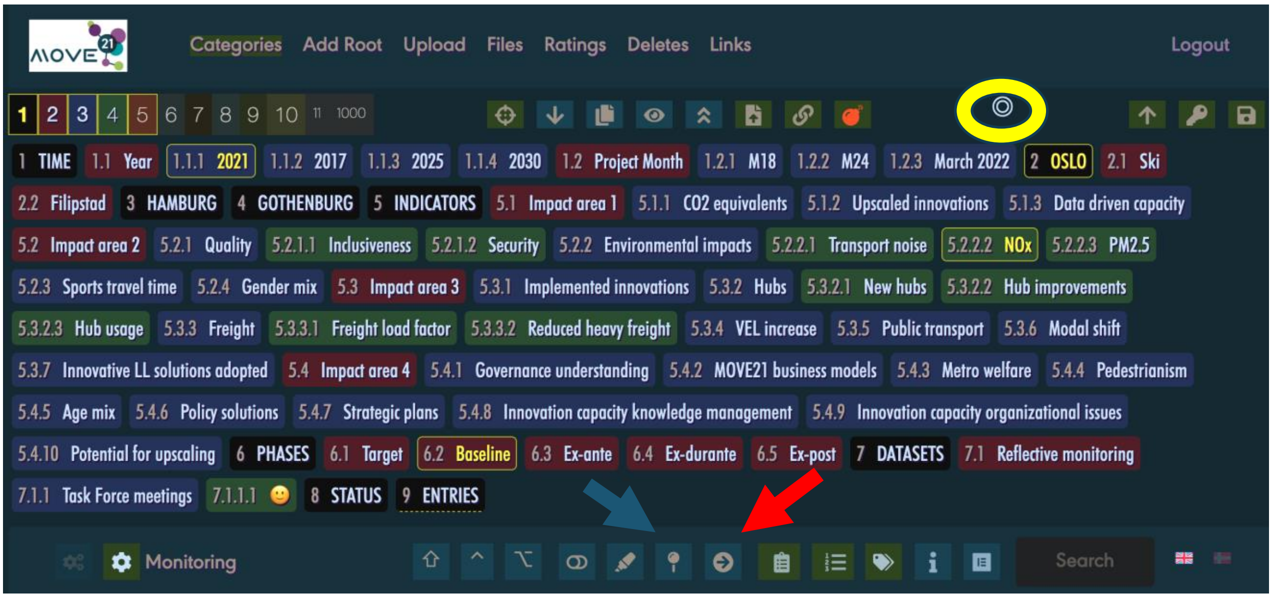


Figure 4: Pin symbol (blue), right arrow (red), and rating=entry indicator yellow circle

3.8.2 Entering values:

To enter the actual 2021 baseline-value for NOx for Oslo:

Select

1. **INDICATORS>Impact area 2>NOx**
2. **Baseline**,
3. **TIME>Year>2021**
4. **OSLO**

Click on the **target symbol** (inside yellow ring)

[3] Care must be taken to distinguish the **UMMS-Category** baseline used as keyword **PHASES>baseline**, and the baseline entries subfolder.

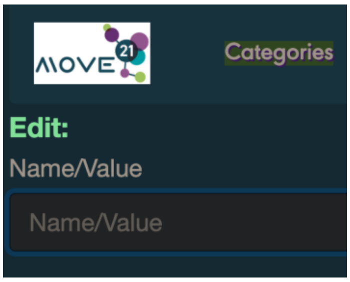


*Figure 5: Edit autogenerated empty **UMMS-Category***

We entered the dummy value 555555<Return>
Using this method ensures that the entry becomes associated with the keywords

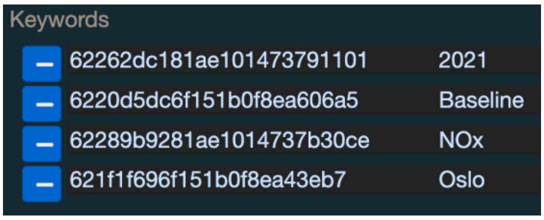


Figure 6: Keywords (ids and names) associated with value 555555

3.8.3 To find the information:

1. Ensure that values under **ENTRIES** are not hidden. (Drag 1000 from the level-toolbar onto **ENTRIES** to show all sub-levels or use ctrl-double-click to expand **ENTRIES** folder)
2. Select one or more of the keywords e.g., **NOx** and turn on filtering (**toggle button** in footer)

Only **UMSS categories** having **NOx** as a keyword are shown See Figure 7). At the moment there is a missing target value indicated with a capital X and a baseline value that are shown. The keywords are shown since highlighting has also been turned on (highlight button in footer)

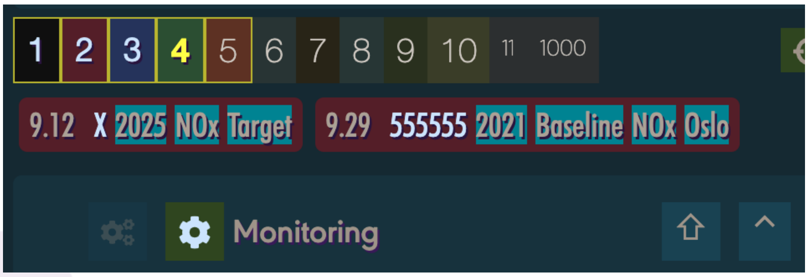


Figure 7: After filtering on NOx and highlighting

If baseline had been selected together with NOx as keywords only 555555 would have been shown.

3.8.4 To edit the information

Double-click 555555 (If doble-clicking too done too slow it will be interpreted as an additional keyword selection and as a result nothing shown – to escape: simply toggle filtering off to show all selected values which now also includes the additional **UMMS-Category** and double-click 555555 to edit)

3.9 Pre-entering information

The recipient of the information could use the alternative with the yes/no buttons to enter the **UMMS-Categories** that are to be entered with the "X" to indicate a missing status and instruct each of the cities which keywords to use to edit the value, link or upload the desired information.

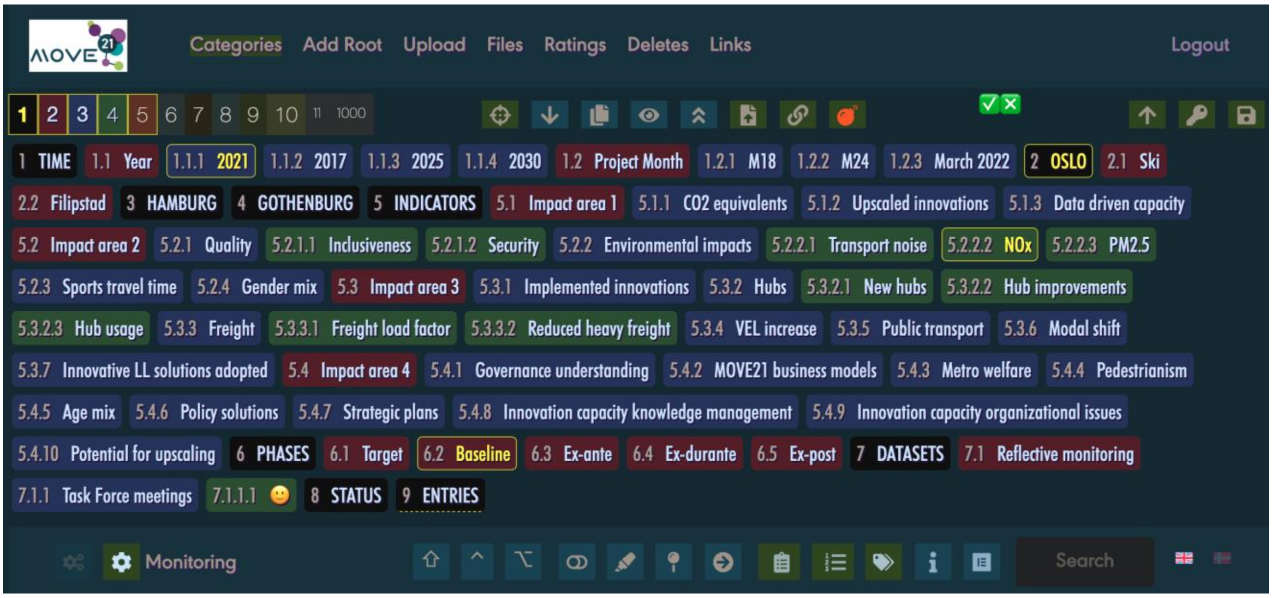


Figure 8: Generating an empty or status value with pre-assigned keywords

If the entry is a simple value, the existence of the value will show that it has been entered, but if it is a upload or a link, the status needs to be changed. Entering **:YES:** or :**NO:** will be replaced with the V or X symbol. To enter smiling emoji faces enter **:1:** … **:5:**

3.10 Cloning functionality

Cloning (using the copy icon button in the header tool bar) allows a **UMMS-Category** to be used as a template, thereby avoiding having to enter the same content multiple times. This is especially useful if a set of parameters have been defined, since the set of parameter descriptions are copied over, and only the values need to be replaced.

In situations where one wishes to keep track of some characteristics for an entity (name, address, city) or compile a set of records etc.) it is possible to create as many parameter fields as you wish and subsequently just clone the **UMMS-Category** with the complete parameter structure already in place. To keep categories used as templates separate, a **TEMPLATE** root **UMMS-Category** could be defined, and templates moved under this root **UMMS-Category**.

When creating documents, one often needs just a different name for a set of documents that have similar content. When creating the document, it is possible to specify that a copy of the document should still be available after pressing submit. This allows the copy to be created with a new name, and the content from the previous entry available for editing.

3.11 Deleting documents

To delete a document, it is sufficient to select it and click/tap the **UMMS** trash can icon. To avoid mistakenly deleting other categories that may have been previously selected, but forgotten, the trash can is painted as a red bomb when more than one **UMMS-Category** have been selected. Select one or more categories and click on Trash button to Delete.

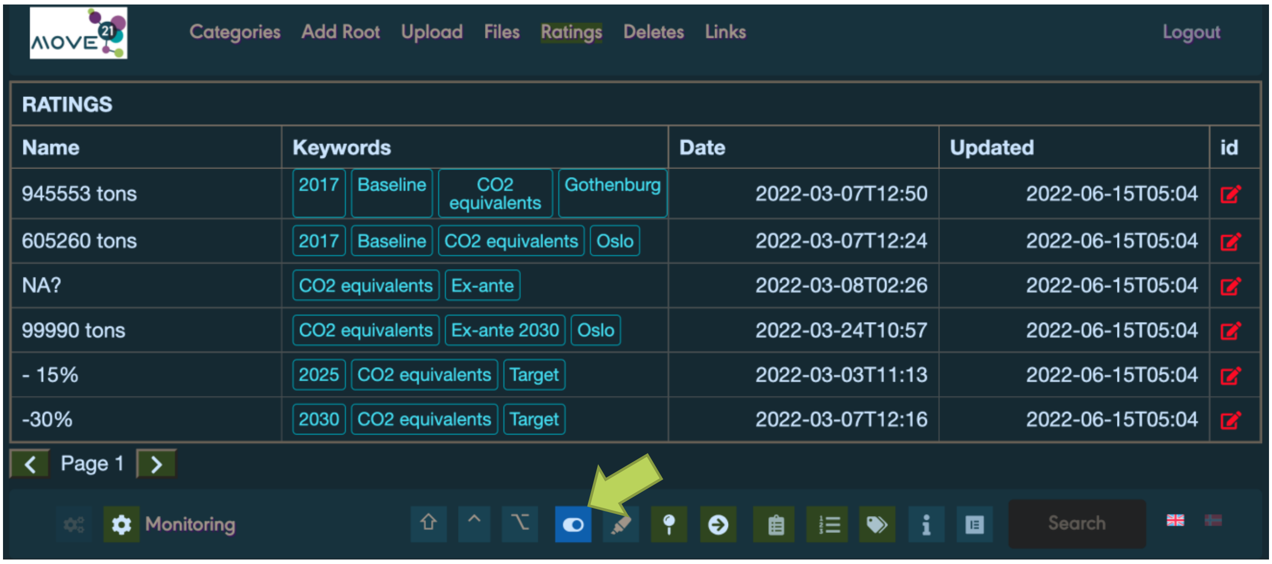
Categories are not removed physically but marked as deleted.

3.12 Resurrecting Deleted **UMMS-Categories**

Menu alternative Deletes contains a list of recent deletes sorted with most recent on top. A resurrect button undeletes the entry. In situations where a parent and children have been deleted it is best to undelete the parent first. Since a **UMMS-Category** is connected to many other **UMMS-Categories** it is best to check that linkages and keywords are as expected, and if not, fix missing entries.

3.13 List of Ratings/entries with keywords

Choosing the menu-alternative with Ratings will show a complete list of all entries that have been entered under a pinned parent **UMMS-Category**. To show only entries/ratings associated with a keyword, click on the keyword (e.g., the **UMMS-Category** containing the **CO2 equivalents** KPI, and turn on filtering by toggling the filter button in the footer. (See Figure 9)



Name	Keywords	Date	Updated	id
945553 tons	2017 Baseline CO2 equivalents Gothenburg	2022-03-07T12:50	2022-06-15T05:04	
605260 tons	2017 Baseline CO2 equivalents Oslo	2022-03-07T12:24	2022-06-15T05:04	
NA?	CO2 equivalents Ex-ante	2022-03-08T02:26	2022-06-15T05:04	
99990 tons	CO2 equivalents Ex-ante 2030 Oslo	2022-03-24T10:57	2022-06-15T05:04	
- 15%	2025 CO2 equivalents Target	2022-03-03T11:13	2022-06-15T05:04	
-30%	2030 CO2 equivalents Target	2022-03-07T12:16	2022-06-15T05:04	

Figure 9: Entry values associated with CO2 equivalents. Filter button: yellow arrow

Clicking on the edit symbol, enters the edit mode where the value can be changed.

3.14 Adding links and uploading documents to **UMMS-Categories**

To **add a html link** to a **UMMS-Category**, select **UMMS-Category** you wish to attach link to and click link symbol. Web addresses can simply be dragged into URL field.

To **upload a file** to a **UMMS-Category**, select **UMMS-Category** and click upload button. Files can be uploaded without specifying that they should be attached to a **UMMS-Category**. They will still be associated with the current set of categories that is active. Use menu alternative: **Upload**.

When uploading files, it is possible to specify that an image should become a frontpage **Image when showing the UMMS-Category.** This could be a map, a picture, .png-file, .svg icon or a zip collection. In special situations it could also be useful to have the icon appear in front of the category name, and it is possible to specify that an uploaded icon should be used in this way.

To **display the content of** a **UMMS-Category**, where the image is shown, links are clickable, and files downloadable without having to enter edit mode by double-clicking, click on eye-symbol in the top toolbar.

Uploaded files can be listed using the **UMMS** menu alternative “Files”. When one or more categories are preselected, the list will be restricted to uploaded files associated with these categories only.

3.15 Collapsing or exploding information levels

When a level button in the top left toolbar is clicked, categories/cards with higher numbers (=lower levels) will globally be hidden. Click on **1**, and only top levels will be shown. Click on **3** and the three top levels are shown. See Figure 10where the first three active levels in the level-toolbar are shown with a narrow yellow border, whereas the layers that are hidden have no border.

Figure 10 Top left level-toolbar containing colour coded level buttons

The categories belonging to the top level have a black background – same as the number 1 in the level toolbar. For situations where a single **UMMS-Category** is selected, the colour of the corresponding level number in the level-toolbars is bright yellow See Figure 10 and the number “**2**” in yellow.

3.15.1 Local hiding and showing categories

While the global level buttons restrict how many levels are shown globally, it is often useful to show some categories with more detail, while temporarily hiding children and grandchildren of others.
To hide sub-levels of a **UMMS,** ctrl-double-click the parent **UMMS-Category** having children. This will hide all descendants, and card will be shown with dotted as a reminder – See Figure 10 where children of Oslo have been hidden locally (indicated by a dotted border below Oslo). This can be used to selectively hide the level of detail shown.

To show again **ctrl-double-click** the parent **UMMS-Category** again.

To hide descendants, (children and grandchildren) of a **UMMS-Category**, drag a level number onto the root of the **UMMS-Category**-tree you wish to hide. If the root currently has level 2 and you drag 1 onto it, it will be hidden since its “display-level” is lower than what is necessary for it to be shown

The parent **UMMS-Category** of the hidden sub-tree will have a dotted underline to indicate that some descendants are hidden. **To undo** level restrictions, drag the “1000” number onto the **UMMS-Category** and everything below will be shown. (Visibility can still restricted by how many levels you currently show globally).

3.15.2 PANIC BUTTON

You can click on the last button in the footer to undo all work on restricting levels and show all levels everywhere. (See Figure 11)

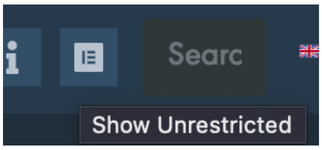


Figure 11: Panic button to undo all local restrictions

However, this means that all restrictions that were in place needs to be re-implemented, so use when everything else fails.

3.15.3 Isolating sub trees

To hide everything except for a subtree, you can isolate it using the crosshair button in the second header toolbar. This is useful when you are batch creating or cloning entries and with to focus on this task and not on what is in other parts of the **UMMS**. You can repeat the process on a sub-tree of the sub-tree to focus on lower-level detail. To undo, select nothing (alternatively click on the MOVE21 Logo that deselects everything or use the info page to remove selections) and press the crosshair button again.

3.16 Rearranging content

3.16.1 Alter sequence and sequence number

It is possible to use drag and drop functionality to alter the sequence (and numbering of) **UMMS-Category** children by moving one **UMMS-Category** child forward or backward from its position by dragging it on top of the sibling **UMMS-Category** which place it should take. The sibling it replaces and those on the right side will be pushed back a step.

If the 5th root **UMMS-Category** is moved in front of the 2nd root **UMMS-Category**, it automatically has its number changed from 5->2. This number change also affects the numbering of in-between **UMMS-Category** roots (2->3, 3->4, and 4->5).

When a parent **UMMS-Category** number is changed the numbers of all **UMMS-Category** descendants are updated automatically

- Previous **5.7.2** becomes **2.7.2**

1. Previous **2.4.6** becomes **3.4.6**

Drag and drop can also be used to move children-trees. Select the children then drag the single up-arrow symbol in the rightmost top toolbar onto the adopting parent.

3.16.2 Move to a different place in the **UMMS**-hierarchy space

If you wish to move a **UMMS-Category** with its children and grandchildren from one place in the **UMMS** to another, you can select it and drag the up-arrow in the top right set of buttons onto its adopted new parent.

3.17 Keywords can be used instead of sub-folders

Putting all datasets in a single folder irrespective of which data collection effort, city, and time point they belong to causes the same problems as using a handbag or wallet without sub-compartments. There are fewer places to search, but more items to choose from and disentangle.

When using sub and sub-sub folders to hold content, the user can choose between several organizing hierarchies are possible: **Effort/city/time point** or **City/effort/timepoint** etc. With **n** main dimensions there are **n!** alternative folder structures.

The **UMMS-Category structures** have an advantage over folder hierarchies in that keywords can be used to identify different **UMMS-Categories** even when the **UMMS-Categories** have the same parent**.**

The **UMMS** is a general tool, that other WPs may choose to make use of. To keep track of efforts such as **Task Force meetings** undertaken by the MOVE21 cities at different time points, it is thus not necessary to create a sub folder for each city and time point. Instead, one could place all data sets under the same parent **UMMS-Category** even though the **UMMS-Category** hold information from different time point[4] (a specific Milestone, version or month) and from different city areas

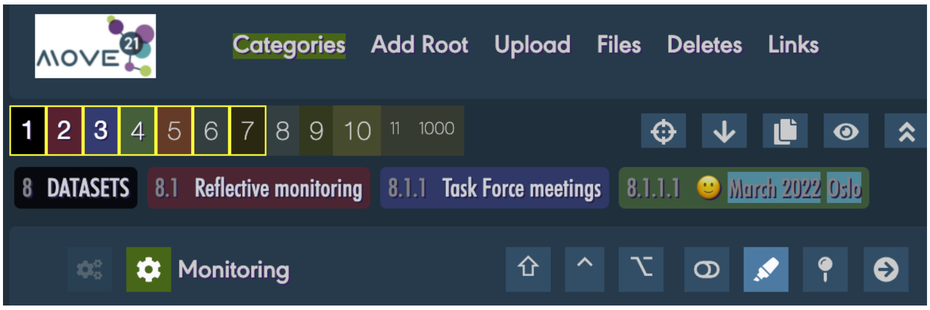


Figure 12: Categories may be given a name that includes symbols, and tagged with keywords

See Figure 12 for an example where a dataset has been uploaded to a **UMMS-Category** with a smiling face having been entered to give quick feedback on receipt status. Here the **UMMS-Category** Task Force Meetings has the characteristic of a common folder for all cities to store process survey data at each data collection round. This is not part of the task description but has been included as an example of how to extend the functionality of the **UMMS**.

In our example **UMMS-Category** 8.1.1.1 has the characteristic of a document with a name value to report receipt status, and an attached dataset, for a given city and time point.
UMMS-Categories that are individually hidden or shown, are displayed the same for all users, so the inclusion of new functionality may wait until the choice of what to selectively display or hide has been individualized. This would allow WP6 to focus on some parts of the **UMMS-Categories** while WP8 focusses on other, without interfering with each other.

Since there are many cities and time points, the city and time point can be used as keywords to identify this specific entry. When selecting Oslo and M18, this data set will be highlighted and selected using the **UMMS** filtering system.

[4] For example, a specific milestone, version or month number

We here only use keywords to distinguish between city areas and timepoints. The user of the **UMMS** could decide that it is not necessary to have a subfolder for each of the data collection efforts under Reflective monitoring and use Task Force Meeting as a keyword instead of as a sub-folder. Should one wish to change the organizing principle the **UMMS** makes it easy to reorganize content,

The flexible structure of the **UMMS** and ease of reorganizing content, and the multiple personalities of the **UMMS-Category** information carrier means that there is more than one way to organize and structure content. This structure is not fixed but can be altered instantly.

This is not different from the choice where to put items when organizing content in folders. Storing items in a “large” parent folder means that it is not difficult to locate which folder the data is located in. On the other hand, there are then many files to manage, and one might want to establish sub-folders to hold the similar files instead of having to select the desired file from a large number of files.

Sets of results may thus be uploaded to a single **UMMS-Category** and the **UMMS-Category** used as a container for all uploaded files, or alternatively **UMMS-Categories** may be created for holding each separate file. (Or the data may have been pre-processed and merged, and only the merged resulting document uploaded.)

An advantage of defining **UMMS sub-categories** for holding specific sets of uploaded files, is that this allows full use of the inbuilt **UMMS-Category** filtering functionality to select and highlight **UMMS-Categories** where the relevant information is stored.

The **UMMS** flexibility is good in that it does not restrict users from following their own preferences. However, all flexibility also imposes a burden on the users of a system in that they must choose how to represent data and make clear choices in how they wish to represent the objects and clusters of objects they wish to keep track of. Since the **UMMS** is a new system, there are no “best practices”, but discussions during the project period will contribute to which organizing principles seems to best match the requirements for monitoring different data sets and indicators.

Levels	Storing
0	**UMMS**
1	**UMMS**/data set
2	**UMMS**/data set/KPI
3	**UMMS**/data set/KPI/time point

When making an error, or getting a false start, an advantage of the **UMMS** is that it is fairly easy to reorganize content and recover/profit from the insights gained.

3.18 Procedure for uploading data sets

1. Select where the new information should be placed (if necessary, create a parent **UMMS-**Category).
2. Create a new child **UMMS-Category** to receive the information. Text can be entered or pasted into the document. (Summary should be used for short text shown when hovering over the card)
3. It is possible to add a parameter structure
4. Documents can be attached to a **UMMS-Category** by uploading after it has been created: Select it first and press the upload button (to the left of the link button)

5. Links can be attached using the link button and entering a description and location. (A web address can be copied/dragged from the browser address line and pasted/dropped)
6. Use procedure for attaching keywords (e.g., city and KPI) so that you can identify the **UMMS-Category** after selecting these keywords and filtering.

3.19 Attaching keywords to a **UMMS-Category**

3.19.1 Multiple keywords, single receiver

1. Select the categories you wish to attach as keywords.
2. Drag the keyword icon onto the receiving **UMMS-Category** you wish to attach the keywords to and release.

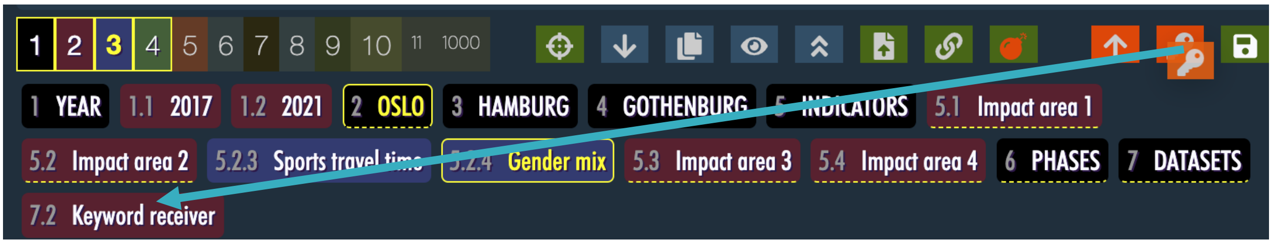


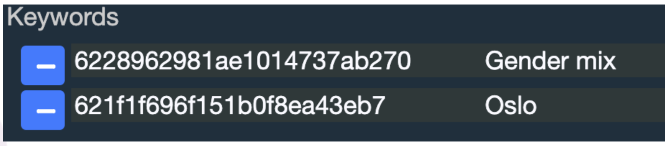
Figure 13: Drag functionality to attach keywords to a UMMS-Category

To assign a set of keywords to not only one, but multiple categories: First select the categories that should receive the keywords, then **click** on the top rightmost temporary "**save**" icon. This saves the selection of receivers temporarily. Then select the keywords and drag the keyword symbol (which now features duplicate keys) onto one of the previously selected receiving categories. The **UMMS** will remember that it has temporarily saved additional categories, and the keywords will be attached to all the temporarily selected receiving categories.

To wipe the temporary selection from memory, **ctrl-click** the **save** icon.

3.19.2 Showing keywords currently attached to a **UMMS-Category**:

Open the **UMMS-Category** for editing (doble-clicking the **UMMS-Category**) and scroll to the bottom.



Keywords		
–	6228962981ae1014737ab270	Gender mix
–	621f1f696f151b0f8ea43eb7	Oslo

*Figure 14: Showing keywords when editing a **UMMS-Category***

The keywords are displayed in a list. Since keywords/categories/files can have the same name, the system attaches a unique _id to each element as 24 hexadecimal numbers. When troubleshooting errors, it can sometimes be good to know these _ids, and it is always the _ids that are used for linking information calculating values etc. Keywords can be individually removed with the **"-"button**.

3.19.3 Highlighting keywords

To highlight all keywords, use the highlight button in the filtering toolbar with no selections active. (See Figure 15).

*Figure 15: Highlighting reveals **UMMS-Category** keywords*

To highlight keywords for only **UMMS-categories having** specific keywords, select the **UMMS-categories** having been used as Keywords, and highlighting will only affect **UMMS-Categories** having received at least one of them as keyword (logical OR).

3.20 Filtering functionality

A **UMMS-Category A** can be linked to another **UMMS-Category B** by having it as a keyword in **UMMS-Category B.** The keyword is in practice a link that points back to **UMMS-Category A**.

UMMS-Category A can after having been selected be used as a filter, by activating the filtering button in the footer toolbar. This allows the current selection (**UMMS-Category A**) to be used as a filter to extract all categories (among these **UMMS-Category B**) previously having obtained **UMMS-Category A** as a keyword.

Filtering is activated and deactivated through the filtering toggle-switch in the filtering toolbar.

3.21 Filtering Logic with more than one **UMMS**-Category

The **UMMS** employs an implicit **AND** between keywords belonging different root hierarchies and **OR** between categories belonging to the same root hierarchy. If the city of **Oslo** and **Impact area 1** and **Impact area 2** are selected as filter categories, categories matching either **Impact area 1** or **Impact area 2** may become selected since impact areas belong to the same root **INDICATORS** hierarchy. However, any of these having **Gothenburg** as keyword instead of **Oslo** will be filtered out, since **Oslo** does not belong to the **INDICATORS** root hierarchy and categories must fulfil both sets of criteria. If no **UMMS-Category** within a root **UMMS-Category** hierarchy is selected, it will not be used for filtering. (Same as if all categories within this root hierarchy would have been selected)

However, within one root hierarchy, **OR** functionality is used. If both **Impact area 3** and **Impact area 4** are used as keywords, the **UMMS-Category** will be selected when at least one of them are selected. If both Oslo and Gothenburg are selected, categories having either of these cities as keyword will be selected.

When both highlighting and filtering, only keywords matching all filter categories are shown. Highlight before filtering to highlight keywords matching at least one of the keywords, thereafter, filter to only see keywords for categories matching the filtering keywords.

3.22 Info page

All selected categories are not necessarily visible from the screen you are working on. You can previously have delved quite deep into a root structure to find and select one of the keywords you wish to apply, and thereafter hidden this root **UMMS-Category** hierarchy to allow you better to focus on selecting the next set of keywords that you wish to apply from a different root hierarchy.

The successive display and hiding of sub-trees make efficient use of screen space in that you can selectively focus on parts of the hierarchies where you need to access information and close them after use.

To double-check preselected entries and pinned receiving parent, use the info button in the footer (See Figure 16)

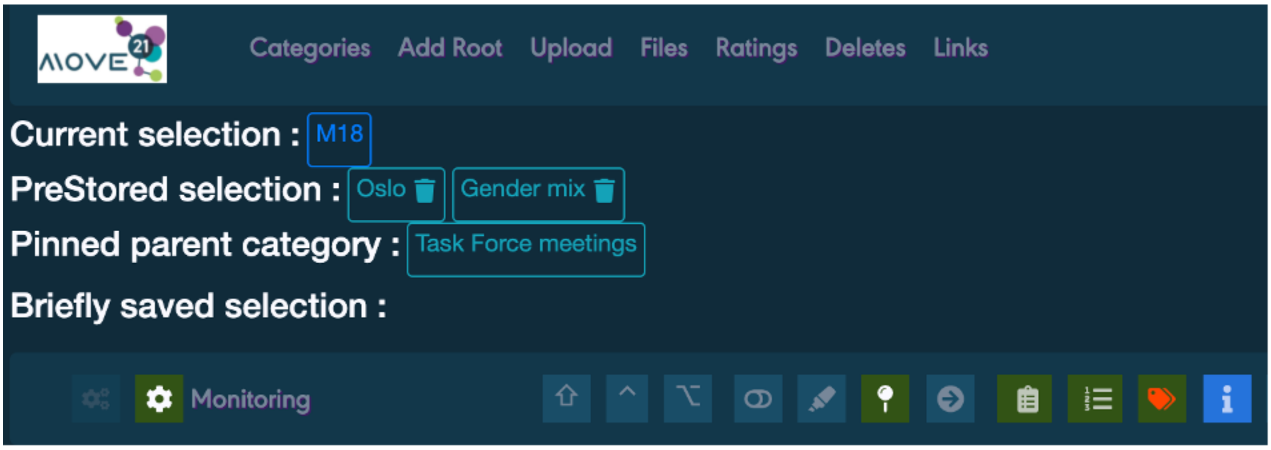


Figure 16: Info button used to check selections and pinned item is highlighted

3.23 Ratings -Advanced

Preselecting keywords and using stars, smileys, or other symbols to rate the combined set of preselected keywords, results in a list of ratings that can be shown as a table. First pin the parent category if it is not already pinned (the same **UMMS parent Category** that was pinned when rating) then choose the Menu alternative **Ratings**.

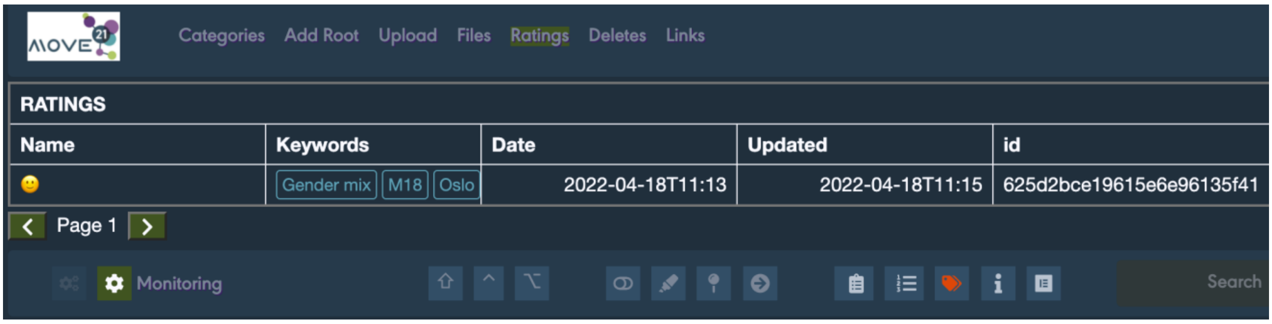


Figure 17: Table of UMMS-categories belonging to the pinned <Task Force Meetings>

This can also be used for viewing **UMMS-categories** containing values that have been entered with a pinned parent **UMMS-Category**.

For this example, we have used a smiley to give feedback about receipt status, and for those where we have a smiling face, the datasets have been uploaded to the category and available for downloads.
To clear pinned category, click pin without any **UMMS-Category** selected.

3.24 Calculations in **UMMS**

Whereas this user guide describes how to enter content into the system, the **UMMS** functionality is generated by the users depending on which **UMMS-Categories** they choose to define, where and how they decide to store data, and how much of the calculations and derived results should be performed by the **UMMS**.

It is consequently possible to generate Information dashboards where status indicators are based on previously input values and data.

Modelling efforts and analyses may be undertaken externally to **UMMS**, allowing the **UMMS** serve as a simple passive repository for the results from such calculations. E.G. **KPIs** can be calculated external to the **UMMS,** and the resulting amounts entered manually into the **UMMS** simply for display purposes.

If the data for calculating a specific **KPI** is in the form of an EXCEL worksheet, the worksheet can be uploaded the **UMMS-Category** where it can be downloaded, edited and a new version uploaded. If one wishes to use the BOX data repository, the worksheet can be saved with the box folder structure, and an external link to this dataset simply be attached to the **UMMS-Category**. By using the link, this worksheet on the project workspace could be accessed, viewed, and updated. This would allow the **UMMS** to serve as an organizing umbrella over worksheets shared on the project workspace repository.

However, for many KPIs the status indicators are simple comparisons between current and baseline values in absolute or relative terms, and these progress indicators can be compared simply against the desired target values. Such calculations need no external tools and can be done directly within the **UMMS-Category** used to display the progress or status indicator.

3.25 Simple inbuilt calculation facility

There will be separate **UMMS-Category** entries holding baselines, current values etc. for different KPIs or for different city areas and phases of the project. There is thus no problem to enter different calculation expressions for different KPIs. It is also no problem to establish **UMMS-Categories holding** different input values, and perhaps calculations to undertake sensitivity analyses, or show different results depending on different input assumptions of traffic growth etc.
The calculations use linked keyword values to perform the calculations and may refer to different sets that have been generated to hold the respective input factors. Both the expressions and the keyword links that the calculation are based on are calculated individually. This also allows different city-areas and different KPI´s to be associated with a tailor-made calculation procedure.

To display progress by calculating simple differences, percentages etc.

1. Create a **UMMS-Category** to hold the value. It can be given any name (e.g., progress, a smiley or whatever) since the name will be replaced with the calculated value
2. Enter an arithmetic expression in the **Definition** field, and
3. Enter a formatting string in the **Description** field.
4. Click on the **Type of component** button **CALCULATED (**This is the only button other than the default **Leave Empty** that is used by **UMMS)**

A simple subtraction to show how much a current value **15** differs from an original baseline value **12** can be obtained by entering ***kw2-kw1*** which is shorthand for "linked keyword 2 value – linked keyword 1 value". This requires that the **UMMS-Category** holding the baseline value **12** has been attached as the first keyword to the **UMMS** status category, and the **UMMS-Category** holding the current value**15** has been attached as the second keyword value.

When saving the **UMMS-Category** the **UMMS** will perform the calculation and formatting defined by the Definition and Description field and replace the name (status) with the actual difference **3**).

To show the change in percent, one can enter ***(kw2-kw1)/kw1*** in the definition field and enter the formatting string **0.0%** to display with percentage sign and restrict the result to showing a single decimal. After pressing enter, the **UMMS-Category** will display the calculated percentage as **25.0%).**

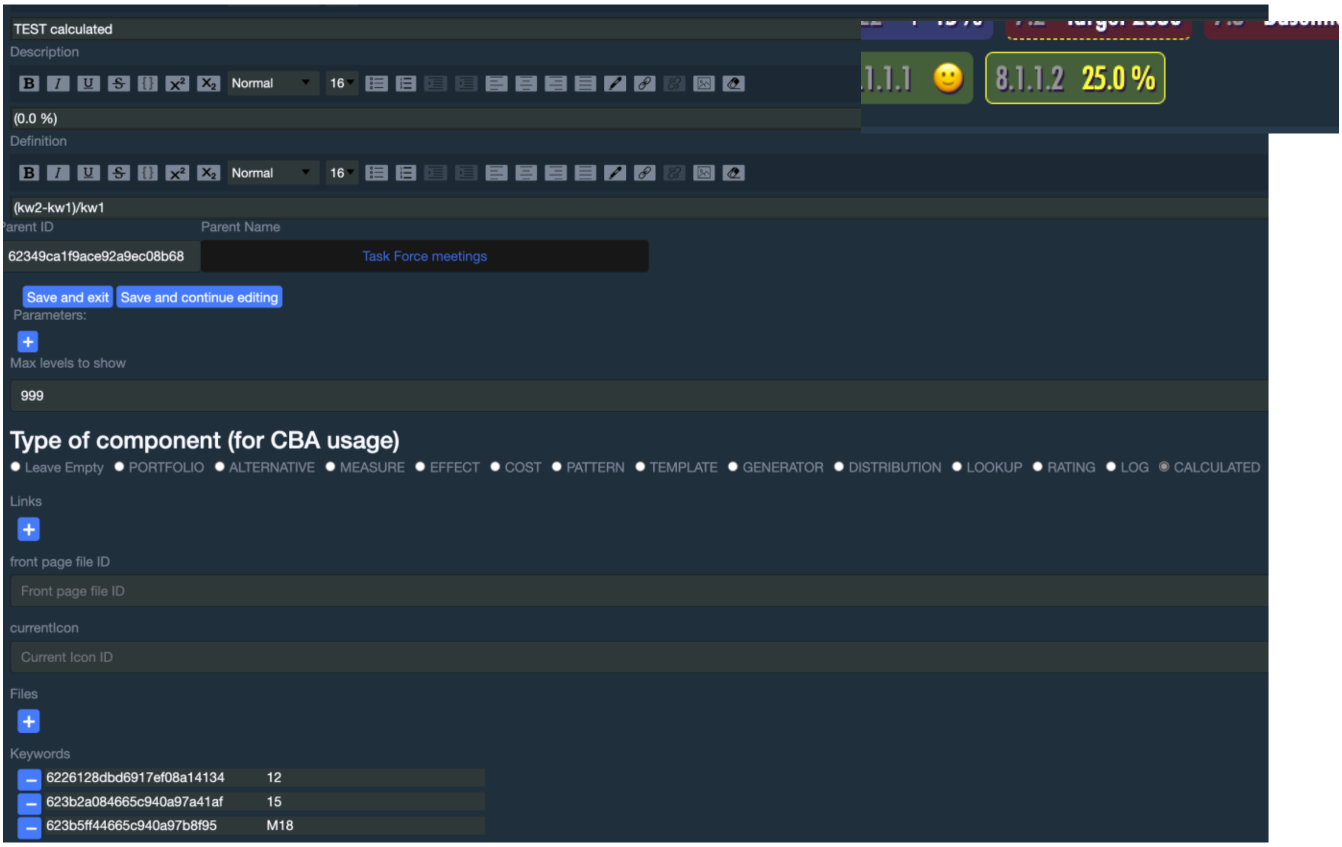


Figure 18: Calculated field

The name of a calculated field becomes replaced with the calculated value see Figure 18 upper right corner.

Se Figure 18 bottom part where the keywords are shown with their values. The expression becomes **(15-12)/12** after the keyword links have been replaced with actual values, and the result of the arithmetic expression is 0.25 becomes displayed as **25.0 %** given the formatting string **0.0 %.**

If you have a need for other such calculations, ask the author of this document to enter them for you.

For those who are familiar with the javaScript language and wish to do their own calculations the javaScript library mathjs and the formatting library numbro is used behind the scenes. Use the links to these packages for more information about available functions and formatting.

The **UMMS** system does the calculations by

1. replacing "kw1" and other keyword indicators with their linked values
2. using mathjs to evaluate the arithmetic expression in the definition field which now only contains numbers and symbols and finally
3. applies the formatting rules of numbro using the formatting string in the description field.

3.26 More complex calculations

If there should arise a need to do more than calculate differences from baseline values, percentages etc. in the **UMMS** itself, the calculations need to be defined as procedures that can be run automatically. The most convenient is to use the JavaScript programming language for such calculations.

The **UMMS** is a full stack node-react web application with **UMMS-Categories** stored as records in a Mongo DB database. This means that JavaScript functions and procedures are available for use both on the front and back end, and derived results can be added as additional fields of the **UMMS** record in Mongo DB. If needed, the aggregation framework of MongoDB could be used.

3.27 User settings are stored per user

There can be multiple users using the **UMMS** at the same time, this will not usually cause problems, but you may notice changes being made by others. Most of the user settings are stored locally on the computer used and will not be affected by other users. If using multiple PCs/tablets, they will each remember the last settings they were used with. However, the choice of which **UMMS-Categories** that are individually hidden or shown at a given time is currently only defined globally, meaning that when several users are hiding or revealing previously hidden items, the operations of one user could interfere with the operations of another. Hopefully, it is not too difficult to individualize how the categories are shown, and store each user´s settings, thereby reducing interference. In the meantime, it would be useful to try to leave the system after entered new data and updated values, more or less in the same shape condition that it was entered.

5 Further work

This report includes the **initial** user manual of the **UMMS**. However, the **UMMS** is not static and will be built and incorporate changes as the MOVE21 urban innovation cases become finalized, developed and potentially upscaled during the project period. The **UMMS** will be supplemented and amended as MOVE21 progresses and can be reutilized for other urban innovation projects. The **UMMS** website will also from time to time incorporate new content and new functionality. However, only the online user manual will be updated to reflect such changes and not this initial accompanying “launch” document.

The **UMMS** is a general repository and can be expanded with new sites and projects and used for completely different projects after defining new sets of appropriate **UMMS-categories**. The **UMMS** site will be kept alive for at least two years after project end.