Action 8 - Data Standards Supporting Citizen Participation in Urban Planning

Final Report

Theme: Urban planning & citizen participation
Objective: Better Regulation
Date enacted: 04.04.2019
Regulatory agency: LGV (Hamburg) and SBF (Helsingborg)

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1. Summary

Action 8 of the Digital Transition Partnership (DTP) is part of the Urban Agenda for the EU (UAEU). This Action is focused on citizen participation in the urban planning process with the aim to support citizen centric planning with a standardized Participatory Data Specification (PDS). Once adopted, this standard would facilitate the exchange and processing of participatory data, thus bring lots of benefits to all parties involved in a participatory process.

To achieve this goal different participatory projects and relating data from Sweden and Germany were analysed to determine both their similarities and differences. Built upon this analysis and practical experience from working on citizen participatory projects the PDS–a data specification–was developed which should satisfy most common requirements for data collection during participatory projects. During the development of the PDS-model several consultations with external experts took place for an evaluation of the preliminary results. The opinions of the experts were then taken into consideration in the following work, a written review from the experts is also included in the package of results. Final results of this Action include the final report and a UML model developed with the software Enterprise Architect. Other working results are also included as appendices to the report, including a comparison of existing Open Data categories and an analysis of participatory data from different projects that took place in Helsingborg or in Hamburg. As the final phase of the Action a reference implementation of the PDS was carried out in the city of Hamburg with its open source digital participation tool DIPAS as a test bed, for which an API was programmed and implemented for the exchange of participatory data based on the PDS. Details of the implementation and remarks from this phase are also documented in this report in Chapter 5.

As initially set out in the Action Plan, this action had two goals: to define a standard for participatory data, and to analyse the existing framework of INSPIRE-Planned-Land-Use regarding its suitability for comparing land use regulation in a detailed level between European cities. However, the latter task had to be given up due to limited resource and capacity. Nevertheless, we still see the relevance of this unfinished part of the Action and would hope to be able to pick the topic up in the future.

From our work we conclude that a standard for participatory data would bring benefits for the citizen centric urban planning, at the mean time much more effort is required to establish a digital planning process in order to fully incorporate the power of digitalisation. To achieve this a holistic approach must be taken and modern technology has to be probed and implemented. The development of standards supporting citizen participation is a small step in this direction, there is much more potential in the planning and building branch that is yet to be exploited.

2. Introduction

2.1 Background

Today citizen participation–in informal and formal processes with different degree of detail and intensity–is an integral part of spatial planning processes in Europe. Participation process enhances the transparency, supports the identification of problems especially at the early stage of planning and helps to raise acceptance of the resulting projects among citizens. While participation in most cases still requires the presence of public, the rapid development of modern technology has opened up new possibilities for arranging the process in more modernized and innovative ways. In many cites online participation is now becoming normality.

Although the use of digital tools provides one of the key factors for increasing citizen participation, cities are still faced with various challenges in effectively accessing and using the participatory data. As the scope of participation expands and more opinions expressed and collected, it will also become increasingly difficult for the responsible person to evaluate the citizen contributions and draw conclusions from them. Not only the amount of contributions, but also the time span and spatial distribution can sometimes create changes in working with participatory data. For one planning project many participatory phases might be carried out, in some cases with large time span in-between. If the data collected in different phases are stored in various formats or aren't properly stored in a dedicated system, it could cause difficulties to make an overall assessment of the public opinion based on all the contributions collected. Similar problem rises if cross-project evaluation should be made for a specific, larger area. There are various departments of the administration carrying out participation procedures on their own responsibility, with different persons in charge. This means that different methods, technologies, tools, service providers and time periods are chosen. Therefore the collected data is organized, stored and structured separately, leading to separate datasets, which are not (easily) comparable to other project-results. Some service providers might not even be interested (and normally not paid) for editing and digitizing the generated datasets. All these factors result in many data-silos which are not connected and not accessible for different stakeholders, researchers, etc.

One way to address these problems is to establish a common standard for digital participatory data while advocating digital participation or digitizing analogous participatory datasets. As of today the datasets (contributions from citizens, representatives and other stakeholders) collected in participatory projects are mostly unstructured. As result the data storage and exchange sometimes take on a "messy" form and this hinders the development of digital data processing tools. All in all a standardized method on how to structure the collected participatory data is still missing–and therefore the full potential of the data is generally not taken advantage of.

2.2 Aim

The aim of the action is to develop a transferable data specification with which contributions submitted by the citizens, representatives and other stakeholders (participatory data) during participatory projects can be structured. This specification can be utilized for collecting, hosting and providing participatory data, which will facilitate the accessing, using and processing of it. Based on the standard data structure, a computer aided analysis and evaluation of the collected content (opinions, critics, and ideas) will be possible. The results of this analysis could in turn promote dialogues with

and amongst the citizens, improve the participatory methods and further cultivate the participatory culture in urban planning. In the long term this will allow municipalities to keep track of relevant issues, analyse the data and gain new insights in space and time.

3. Fundamentals

3.1 Benefits of data standard

Technical standards are widely used in the ICT branch to ensure compatibility of products between different companies or organisations. Through the establishment of common technical criteria, methods, processes or practices, technical barriers can be prevented when different parties work in the same field. A data standard specifies common data structures and semantics based upon which software can be developed. The use of data standard enables interoperability between software products and ensures a lossless data exchange.

In the case of citizen participation, for a data standard to be utilized, digital tools and applications have to be compatible to it, this means they should be able to generate, transport and process data as specified in the standard. As a result citizen contributions from different participatory processes can be collected and stored in a uniform data structure. They can be more easily aggregated and analysed since the data follow a given structure. Furthermore they can be exchanged between different software products without loss or misinterpretation of information. This again prevents vendor lock-in effect and provides the municipalities with more freedom in organising their participation process or aggregating datasets from different projects. But this does not mean that the benefits are unilateral. Digital tools based upon standards enjoy a longer longevity and are wider applicable. For the product provider this means more potential customers and lower developing costs since even if individual requests can be made by customers, certain modules won't have to be rewritten. The usage of such a standard would also bring more transparency and communication among groups of citizens since the collected datasets could be more easily published and accessed online.

3.2 Participation in the planning process

The following graphic shows the usual proceedings throughout a typical planning process. This can be a local plan/detail plan, a comprehensive plan or even an urban design project. Upon a planning proposal, public consultation can be organised before the decision to initialise a planning process. Contributions gathered in this phase can be helpful for the planners, engineers etc. when working on the draft plan since they often contain citizen insights into specific local issues. After the drafting phase, the planning proposal will be put on public consultation. The drafting and consultation may take place repeatedly as the planners work on the proposal, until it is finalised and adopted and implementation takes place. In both phase 2 and 4 in the graphic, where public consultation takes place, a data standard (here PDS) should be utilized for collecting, storing and providing participatory data.

Figure 1 Main phases in a typical spatial planning process. Phases 3 and 4 would be repeated as necessary

4. The Participatory Data Specification

As stated earlier, a participatory data standard should facilitate more effective collection, analysis and comparison of citizen contributions. To allow applications to be built upon the standard it must be structured in such a way that all or at least most of the necessary information throughout a participation process are included in the modelling. To achieve this various participation projects in Sweden and Germany were analysed to determine the range of necessary information. Built upon this analysis, at the same time relying on practical experience from working on citizen participatory projects the Participatory Data Specification (PDS) was developed, the structure of which will be shortly introduced in the following passage. The analysis of data structures of existing data is included as appendix.

4.1 Structure of PDS

The structure of PDS is visualised using the Unified Modeling Language (UML). The UML model developed here is to be understood as a generic model independent of any platform or implementation technology and applicable to multiple system designs. For a concrete implementation it has to be further specified according to the implementing technology. Also a technical schema would have to be generated to verify the compatibility of instance files and thus of applications. This part of work is not included as an activity of this Action due to limitation of time and resource. Nevertheless since most participatory data include geographical information and as they would not contain excessively complex geometries, our suggestion is to use the GeoJSON format for an implementation (GML would be another possibility, but it's a more heavy-weighted format than GeoJSON and less practical for use in web applications). The model consists of different parts (object classes in the sense of data modelling), of which the most important ones are presented here in tabular form with their properties. The properties (or field name in the sense of a database table) are listed with a description, its data type, and also the information if the data is mandatory or categorized as open data. For a complete overview of all the classes please refer to the UML model.

4.1.1 Main Project

A main project is to be understood as the overall planning process. This could be a redevelopment project, a comprehensive plan, a local planning, a regional plan, etc. The main project has a long time span with different participatory and non-participatory phases, which could include various participatory projects.

> *Example for a main project: "Living Harbour Project", Redeveloping the harbour area, timespan from 2006-2020*

4.1.2 Participatory Project

A participatory project describes a certain participatory procedure, in which different stakeholders are involved to voice their opinion as contributions. For each main project there could be as many participatory projects as needed throughout its duration and within its geographical range. A participatory project usually covers the same area as the main project, but could also have its own project area. For each participatory project the collected data (contributions) would be stored in a database and can later be retrieved through an identifier.

Example for a participatory project: in the "Living Harbour Project", a 6-week online participation "Your ideas for the Living Harbour" was organised in May-June 2007

4.1.3 Contribution and Comment

A text-piece written by a participant which also contains information about which participatory project it belongs to. Contributions represent the public opinion collected in a participatory process. Comments can be made to the contributions, other comments or to attached files to the participatory project.

Example for a contribution: Geolocated text on a map from one participant during the "Your ideas for the Living Harbour" online participation

4.1.4 Processing of contribution (ContributionProcessed)

Though not always necessary, if the contributions should be modified through subsequent processing, the processed data should be represented with the class *ContributionProcessed*. One potential use-case could be a re-categorisation of the contribution by the project responsible. These information should be stored to keep track of the processing.

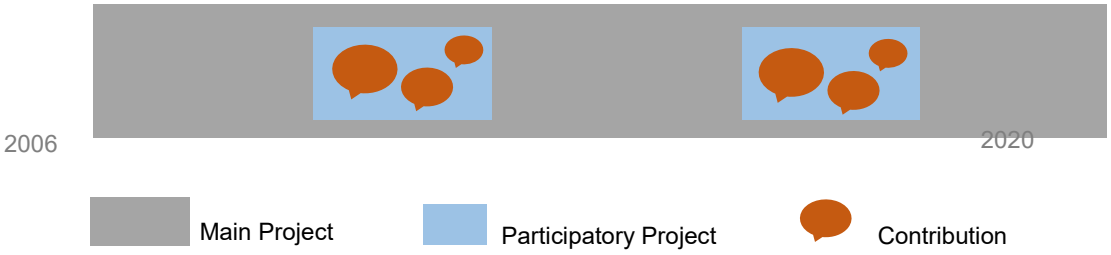
Example: One comment was classified "Mobility" by the participant himself, later the project responsible found out that it was actually talking about the "Street Space" and decided to give this contribution a new category "Public Space"

4.1.5 Author

Optionally, an organising institution might decide to collect some demographical Information about the participants. That contains only information provided voluntarily by the author, for example age, gender, postal code, etc. The collection and using of personal information must follow the GDPR strictly. This is also reflected in the data structure: personal data are stored in a separate database and cannot be traced back through the author-ID.

4.2 Schematic Overview

The following diagram explains schematically the relationships among a Main Project, its related Participatory Projects and the Contributions.



4.3 Technicalities

PDS doesn't specify any specific format for the data collection and processing, common formats like GeoJSON or GML could be chosen, the decision should be based on the local specificity. As next step, a standard API should be specified to facilitate data exchange and usage through different applications.

4.4 Data Structure of the classes

In the following section the data structure of the classes mentioned above are listed in a tabular view.

MainProject					
Field Name	Description	Type	Comment/Link	Mandatory	Open Data
extent	Geographical extent of the main project (whole planning project)	Geometry		N	Y
id	An automatically generated identifier for the project	IdType		Y	N
nameShort	Short name or abbreviation of the project	String		N	Y
nameFull	The full, formal name of the project	String		Y	Y
dateStart	Starting date of the project, compliant to ISO 8601 (YYYY-MM-DDThh:mm:ssTZD)	LocalDateTime	ISO 8601, the International Standard for the representation of dates and times https://www.w3.org/TR/NOTE-datetime	Y	Y
dateEnd	Ending date of the project, compliant to ISO 8601 (YYYY-MM-DDThh:mm:ssTZD)	LocalDateTime		N	Y
website	URL to the web site of the project	URL		N	Y
description	Description of the main project, e.g. project type, aim of the project, expected outcomes etc.	String		N	Y
mainResponsible	Name of main responsible person, unit or organization for the main project	String		N	Y

country	The country of the project represented as a ISO 3166 country code, e.g. GER	CountryCodes	list of values	Y	Y
region	Region of the project in accordance with the LAU	LAU		Y	Y
language	The original language used in the project, represented as an IETF language tag, for explanation see also the definition of *LanguageTag* in the specification document	LanguageTag		N	Y
type	type of the project (e.g. comprehensive plan, urban design, etc.) should be defined by the project owner	ProjectTypes		N	Y
participatoryProjects	Participatory projects related to a main project	ParticipatoryProject		N	Y
customAttribute	If necessary more custom attributes could be added to the class	CustomAttributeType		N	N/A

PaticipatoryProject					
Field Name	Description	Type	Comment/Link	Mandatory	Open Data
projectArea	Area of the participatory project, this field is to be filled if the extent of the participatory project varies from that of the main project.	Geometry		N	Y
id	An automatically generated identifier for the project	UUID		Y	N

nameShort	Short name or abbreviation of the project	String		N	Y
nameFull	The full, formal name of the project	String		Y	Y
dateStart	Starting date of the project, compliant to the ISO 8601 (YYYY-MM-DDThh:mm:ssTZD)	LocalDateTime		Y	Y
dateEnd	Ending date of the project, compliant to the ISO 8601 (YYYY-MM-DDThh:mm:ssTZD)	LocalDateTime		N	Y
website	URL to the website of the project	URL		N	Y
description	Description of the aims, content and target groups of the participatory project	String		Y	Y
processingStep	The current processing step of the main project in which the participatory project takes place. The steps can be predefined and the values may vary depending on the country, so they should be defined uniformly in a district/city/region/or even country	ProcessingSteps		N	Y
areaSize	Size of the participatory project area in km^2	Real		N	Y
locationDescription	Qualitative description of the location, e.g. demographics, land use	String		N	Y
owner	Name of person, unit or organisation responsible for running the participatory project (project manager)	String		Y	Y

publisher	Name of person, unit or organisation responsible for providing the data	String		Y	Y
standardCategories	Standard categories in a list defined by the project owner, e.g. mobility, housing, greenery etc. For each contribution, a value from this list would be chosen to classify it.	StandardCategoriesList		Y	Y
standardSubcategories	Standard subcategories in a list for a participatory project defined by the project owner. For example the category mobility can have the subcategories pedestrian traffic, vehicle traffic, bicycle traffic etc.	Subcategories List		N	Y
referenceSystem	The EPSG code of the original geographical data	EPSGCode		Y	Y
projectContributionType	A list of allowed values for the types of contribution in the project. This should be provided by the person or organisation responsible for the participatory project.	ContributionTypes		N	N
customAttribute	If necessary more custom attributes could be added to the class	N/A		N	N/A
mainProject	Main project, which the participatory project belongs to.	Main_project		N	N
hasParticipatoryText	Contributions made in a participatory project	ParticipatoryText		N	N
hasAttachment	Attached files to a project	Attachment		N	N

Contribution					
Field Name	Description	Type	Comment/Link	Mandatory	Open Data
location	Location the contribution concerns, could be a point, a line or a polygon. This field should always be filled if the contribution can be located.	Geometry		N	Y
id	Automatically generated identifier	UUID		Y	N
dateCreated	Automatically generated date when contribution was created	Date YYYY-MM-DDThh:mm:ssTZD	ISO 8601, the International Standard for the representation of dates and times	Y	N
link	URL to a specific contribution, if existing			N	N
title	Title of contribution	String		N	Y
latitude	Latitude of the point where the stated issue in the contribution is located. When the location is specified with a line or polygon, this field should be left blank.	Real	WGS 84	N	Y
longitude	Longitude of the point where the stated issue in the contribution is located. When the location is specified with a line or polygon, this field should be left blank.	Real	WGS 84	N	Y
attachment	URL to the attachments	URL	pdf, documents, drawings,	N	Y
contributionType	List of the predefined types of contribution, e.g.	ContributionTypes		N	Y

	suggestion, opinion, criticism				
contributionContent	Content of the contribution	String		Y	Y
status	processing status of the contribution	StatusValue	See also open 311, new, in progess, finished, categorized,... - shows the actual status of the contribution (e.g. for report(complaint-systems)	N	Y
keywordSuggested	Upon input, the system suggests keywords for the author to choose from, the chosen keywords will then be assigned to the contribution and used for clustering	String	Stored as comma-seperated text?	N	N
keywordPicked	From the keywords that the AI system suggested, some are accepted and some rejected by the user. User might also suggest other values. The accepted and user generated keywords are stored here for further processing.	String		N	Y
category	Chosen by the contributor, this is a value from the list of standard categories defined by the project owner.	StandardCategoriesList		Y	Y
subCategory	Chosen by the contributor, this is a standard subcategories defined by the product owner upon need.	StandardSubCategoryValue		N	Y
votingPro	Citizens have the possibility to vote for or	Integer	Records the number of pro-voting	N	Y

	against a contribution. This feature is optional, the final results of the voting will be stored here.		independent of the voting method (emoji, 5 stars, clapping etc.)		
votingContra	Citizens have the possibility to vote for or against a contribution. This feature is optional, the final results of the voting will be stored here.	Integer	Records the number of contra-voting independent of the voting method (emoji, 5 stars, clapping etc.)	N	Y
commentsNumber	The total number of comments on a contribution	Integer		Y	N/A
sentiment	Here an example of a custom attribute: sentiment. Another typical function of AI text analysis is the identification of sentiment. The result can be represented in different ways. Whether classified into categories like positive, negative and neutral or represented on a certain scale, this can be further specified by the data analyst and project owner.	SentimentType		N	N
customAttribute	If necessary more custom attributes could be added to the class	N/A		N	N/A
commentedBy	Points to the comments made to the contribution	Comment		N	Y
belongToProject	The participatory project, to which the comments belong	ParticipatoryProject		Y	Y
author	Author who wrote the contribution or comment	Author		N	N

ContributionProcessed					
Field Name	Description	Type	Comment/Link	Mandatory	Open Data
location	Location the contribution concerns, could be a point, a line or a polygon. This field should always be filled if the contribution can be located.	Geometry		N	Y
id	Automatically generated identifier	UUID		Y	N
dateCreated	Automatically generated date when contribution was created	Date YYYY-MM-DDThh:mm:ssTZD	ISO 8601, the International Standard for the representation of dates and times	Y	N
dateEdited	Automatically generated date when contribution was edited	Date YYYY-MM-DDThh:mm:ssTZD		N	N
link	URL to a specific contribution, if existing			N	N
title	Title of contribution	String		N	Y
latitude	Latitude of the point where the stated issue in the contribution is located. When the location is specified with a line or polygon, this field should be left blank.	Real	WGS 84	N	Y
longitude	Longitude of the point where the stated issue in the contribution is located. When the location is specified with a line or polygon, this field should be left blank.	Real	WGS 84	N	Y

attachment	URL to the attachments	URL	pdf, documents, drawings,	N	Y
contributionType	List of the predefined types of contribution, e.g. suggestion, opinion, criticism	OpinionTypes			Y
contributionContent	Content of the contribution	String		Y	Y
status	processing status of the contribution		See also open 311, new, in progess, finished, categorized,... - shows the actual status of the contribution (e.g. for report(complaint-systems)	N	Y
keywordSuggested	Upon input, the system suggests keywords for the author to choose from, the chosen keywords will then be assigned to the contribution and used for clustering	String	Stored as comma-seperated text?	N	N
keywordPicked	From the keywords that the AI system suggested, some are accepted and some rejected by the user. User might also suggest other values. The accepted and user generated keywords are stored here for further processing.	String		N	Y
category	Chosen by the contributor, this is a value from the list of standard categories defined by the project owner.	StandardCategoriesList		Y	Y
subCategory	Chosen by the contributor, this is a standard subcategories defined by	StandardSubCategoryValue		N	Y

	the product owner upon need.				
votingPro	Citizens have the possibility to vote for or against a contribution. This feature is optional, the final results of the voting will be stored here.	Integer	Records the number of pro-voting independent of the voting method (emoji, 5 stars, clapping etc.)	N	Y
votingContra	Citizens have the possibility to vote for or against a contribution. This feature is optional, the final results of the voting will be stored here.	Integer	Records the number of contra-voting independent of the voting method (emoji, 5 stars, clapping etc.)	N	Y
commentsNumber	The total number of comments on a contribution	Integer		Y	N/A
sentiment	Here an example of a custom attribute: sentiment. Another typical function of AI text analysis is the identification of sentiment. The result can be represented in different ways. Whether classified into categories like positive, negative and neutral or represented on a certain scale, this can be further specified by the data analyst and project owner.	SentimentType		N	N
customAttribute	If necessary more custom attributes could be added to the class	N/A		N	N/A
commentedBy	Points to the comments made to the contribution	Comment		N	Y
belongToProject	The participatory project, to which the comments belong	ParticipatoryProject		Y	Y

author	Author who wrote the contribution or comment	Author		N	N
categoryNew	After processing, the responsible person for analysing the data could decide to reassign the contribution to a new category, this will be recorded here.	CategoryValues		N	Y
subcategoryNew	After processing, the responsible person for analysing the data could decide to reassign the contribution to a new category, this will be recorded here.	SubCategoryValues		N	Y
revisesContribution	The ID of the original contribution which was revised.	IdType		Y	N

Comment					
Field Name	Description	Type	Comment/Link	Mandatory	Open Data
location	Location the contribution concerns, could be a point, a line or a polygon. This field should always be filled if the contribution can be located.	Geometry		N	Y
id	Automatically generated identifier	IdType		Y	N
dateCreated	Automatically generated date when contribution was created	Date YYYY-MM-DDThh:mm:ssTZD	ISO 8601, the International Standard for the representation of dates and times	Y	N
link	URL to a specific contribution, if existing			N	N

title	Title of contribution	String		N	Y
latitude	Latitude of the point where the stated issue in the contribution is located. When the location is specified with a line or polygon, this field should be left blank.	Real	WGS 84	N	Y
longitude	Longitude of the point where the stated issue in the contribution is located. When the location is specified with a line or polygon, this field should be left blank.	Real	WGS 84	N	Y
attachment	URL to the attachments	URL	pdf, documents, drawings,	N	Y
contributionType	List of the predefined types of contribution, e.g. suggestion, opinion, criticism	ContributionTypes		N	Y
commentContent	Content of the comment	String		Y	Y
votingPro	Citizens have the possibility to vote for or against a contribution. This feature is optional, the final results of the voting will be stored here.	Integer	Records the number of pro-voting independent of the voting method (emoji, 5 stars, clapping etc.)	N	Y
votingContra	Citizens have the possibility to vote for or against a contribution. This feature is optional, the final results of the voting will be stored here.	Integer	Records the number of contra-voting independent of the voting method (emoji, 5 stars, clapping etc.)	N	Y
commentOnContribution	Contribution which the comment belongs to.	Contribution		Y	N
commentOnAttachment	Attachment which is commented	Attachment		N	N

commentOnComment	Comment which is commented	Comment		N	N
commentedBy	Points to the comments made to the comment	Comment		N	Y
author	Author who wrote the contribution or comment	Author		N	N

Author					
Field Name	Description	Type	Comment/Link	Mandatory	Open Data
id	automatically generated identifier of the author	IdType		Y	N
nickname	The name, under which the citizen prefers to be referred to on the platform.	String		Y	N
institutionRep	Specifies if a person is a representative from a certain institution	Boolean		Y	N
contributions	The contributions a certain author wrote	Contribution		N	N

PersonalData					
Field Name	Description	Type	Comment/Link	Mandatory	Open Data
age	Age / age category of the author	int		N	N
ageCategory	Age category of the author, or use the precise age	AgeCategories		N	N
gender	gender of the author	Genders		N	N
postalCode	postal code of the author	String		N	N

country	country the author comes from	String		N	N
name	full name of the author	String		N	N
address	postal address of the author	String		N	N
email	E-Mail address of the author	String		N	N
telephone	phone number of the author	String		N	N
institution	if the author represents an agency or a company, the information of this institution should be filled in	Organization		N	N
belongTo	Owner of the personal data	Author			

Organization					
Field Name	Description	Type	Comment/Link	Mandatory	Open Data
id	Age / age category of the organization	IdType		N	N
name	Official name of the organization.	String		N	N
address	postal address of the organization	String		N	N
postalCode	postal code of the organization	String		N	N
country	country of the organization	String		N	N
email	E-Mail address of the organization	String		N	N

telephone	phone number of the author	String		N	N
website	In case the author represents an agency or a company, the web site of this institution can be specified here				

5. Reference Implementation

As the final phase of the Action a reference implementation of PDS was carried out in the city of Hamburg with its open source digital participation tool DIPAS as a test bed.
DIPAS is a project in Hamburg which runs independently from the UAEU. It's born with the purpose to optimise citizen participation through the use of digital tools. DIPAS is the acronym for Digital Participation System. It consists of a touch table component which can be used during on-site participation workshops (see fig.2) and an online component for desktop and mobile devices. Through the interface participants are able to view different map layers to get information about the planning area or other areas of interest; with a tap on the touch table or a click on the screen they can also leave a geo-located contribution on the map, which can then be viewed and commented by other citizens.

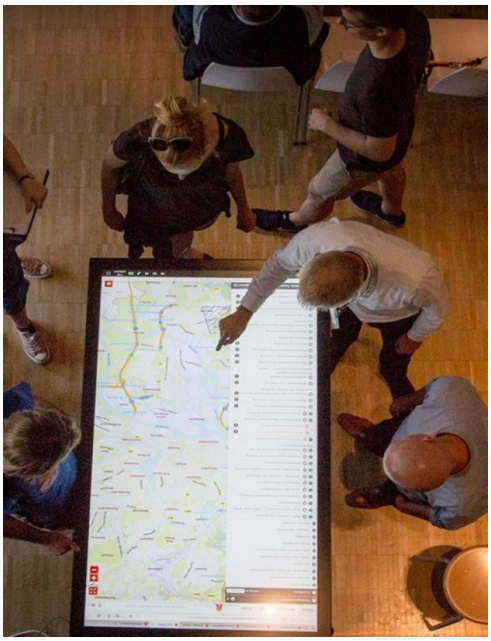


Figure 2 the touch table component of DIPAS can be used for on-site workshops
© Stadtwerkstatt, Hamburg

For the implementation of the PDS data model in the DIPAS system, an API was programmed. Contributions and other project related information stored in the database of DIPAS can be retrieved through this API by other applications or systems for further use. For the output we chose GeoJSON format (see fig.3), an open standard format that was designed to represent simple geographical features. It is a commonly used format, so that the data can be easily reused and processed in other applications. A Specification of this API is included in the appendices. Due to time and resource limit the specification was written in simple text form. Ideally a standard technical specification should be provided e.g. compatible to the OpenAPI specification.

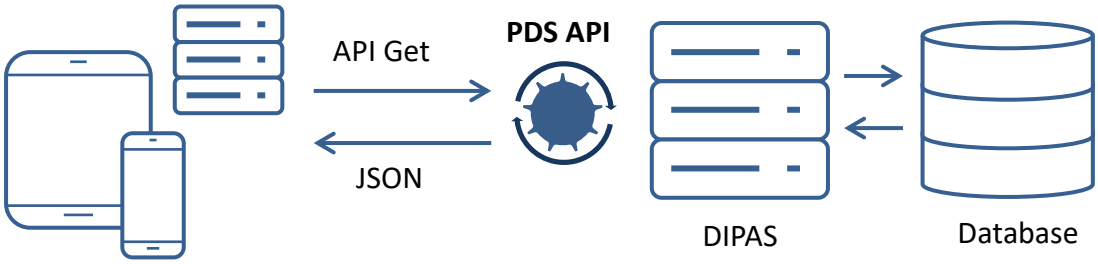


Figure 3 The PDS API allows information to be shared with other applications

As further steps it is planned in Hamburg to use the output from the PDS-API to integrate the collected participatory data into a so-called "participation cockpit" which would allow cross-project evaluation and processing of participatory datasets. Since the Digital Transition Partnership ends this year, this further development will be carried out also independent from the UAEU. The source code of DIPAS, including of course the programming code of PDS-API, was released February this year as public code and is now accessible through the URL http://dipas.org/.

```
{
    "type": "FeatureCollection",
    "features": [
        {
            "type": "Feature",
            "geometry": {
                "type": "Point",
                "coordinates": [
                    10.067739299718799,
                    53.5461983688828
                ]
            },
            "properties": {
                "id": "10",
                "dateCreated": "2020-10-27T14:32:11Z",
                "link": "https://test.beteiligung.hamburg/dipas-053-rc/#/contribution/10",
                "title": "Gesamtkonzept Verkehr",
                "contributionType": "Idee",
                "contributionContent": "Keine einseitiges denken und handeln für eine Verkehrsteilnehmergruppe. Konzept auch für Fussgänger, mehr gastro freie Sitzmöglichkeiten schaffen. Radfahrer nur 1 weg zur Verfügung stellen der entsprechender der Fahrrichtung der Schulzeiten genutz werden darf (z.B. Sierichstr.)",
                "commentsNumber": 1,
                "category": "Verkehr",
                "votingPro": "1",
                "votingContra": "0",
                "keywordSuggested": "entsprechender, einseitiges, Verkehrsteilnehmergruppe, Verfügung",
                "keywordPicked": "Verkehrsteilnehmergruppe, mehr gastro, freie Sitzmöglichkeiten, Radfahrer nur 1 je Fahrrichtung in der Schulzeiten",
                "belongToProject": "ToDo",
                "dipasLocated": true,
                "customAttribute": {
                    "nlp_scores": null
                }
```


Figure 4 Example output of a contribution from the PDS API

6. Challenges

One of the issues we faced defining a participatory data standard regards different ways to categorise certain data. Taking the age categorization for example: different countries hold different standards regarding the intervals in age-categories, even within countries different categorizations are not uncommon, since different agencies or boards applies different interval to categorise age.
The same difficulty exists with the contribution content. In the early phases of the Action one important goal has been set as to provide a list of standard categories with which the contributions could be classified for analytical purpose, since categorisation is a typical approach when working with participatory data. However it has become clear during the working process that such a goal is difficult to achieve. Some contributions are hard to classify, also the needed categories may vary from country to country and from project to project- it's nearly impossible to cover all of them; sometimes new categories could be needed for specific cases. Taking these facts and also the new technical developments into consideration we've come to the following resolution to maintain the possibility to classify the contributions without constraining the categories to a given list: through the data structure the project owner is provided with the chance to define a standard category list and a subcategory list for each of their projects, these lists can be stored in a public registry for review or for reuse. The author of the contribution has to choose one value from the list of standard categories while writing down their opinion. The possibility is provided for the project owner to modify the submitted categories/subcategories of a certain contribution if circumstance requires. Such changes can be recorded in a separate data storage. Another possible means is to analyse the contributions with help of an AI, which would suggest keywords for categorising the contribution while the author writes it. These keywords can be used to further analyse and cluster the contributions. By grouping the keywords, topics can be concluded, the result would be an AI-suggested categorisation. Here the standardised data sets show their advantage because with them an AI can be better trained to provide more precise suggestions over time.
As for other data that need to be categorised, an adaptation to the local requirements is necessary, also the balance between standardisation and flexibility should be found.

7. Prospect

The rapid development of the ICT branch changes the modern life and poses challenge for the traditional way of city planning, but at the same time huge potential has yet to be unravelled for the whole planning process. Digital tools can play an important role in future participatory processes and facilitate better decision making, but digital participation is not the finishing line, much more can be done to optimise the whole chain of urban planning through digitalisation.

7.1 Binding standards on national/EU level

To start the optimisation of the planning process it is an essential step to standardise the spatial plans, this allows the development of automated data processing like building permits. The trend has been seen that different countries have developed or are currently developing national binding standards for spatial planning, this includes XPlanung in Germany (legally binding), standard for spatial plan (RUIMTELIJKE PLANNEN) in the Netherlands and similar endeavour in Sweden, Romania and Finland. On the European level there's the INSPIRE directive regarding standardized Land-use data in all of Europe. Such bindings on national or EU-level are impacting the work towards a standard for participation projects for they influence how planning data are classified and presented. One example is a model for comprehensive planning in Sweden (ÖP-modellen, source https://www.boverket.se/sv/PBL-kunskapsbanken/planering/oversiktsplan/oversiktsplanen/utformning/modell/).
In order to address, amongst other things, the INSPIRE directive regarding standardized Land-use in all of Europe, the Swedish National Board of Housing, Building and Planning develop and maintain a model for Comprehensive planning. This model is, as of 2019, not legally binding. However, it implies certain formats and models on how a comprehensive plan should be presented. Such implication could also, in a near future, be implemented on how a participation project should, or could, be held. In such, a standardized participation data specification could be of help. But it could also be an issue if a national board would recommend a different approach from the one upheld by a standardized participation data specification.

7.2 A holistic approach

From the decision to initiate a plan to its adoption, various steps have to be taken which often include complex works and coordination between stakeholders, in our vision this whole workflow could be optimised with help of digitalisation and automation. This requires not only a holistic, future-oriented approach when setting up or adapting the information systems but also the cooperation between departments, institutions and organisations. The digitalisation of the whole planning process is beyond the scope of this action, nevertheless we would like to address this huge potential and wish that it would be discovered in all of the European counties.

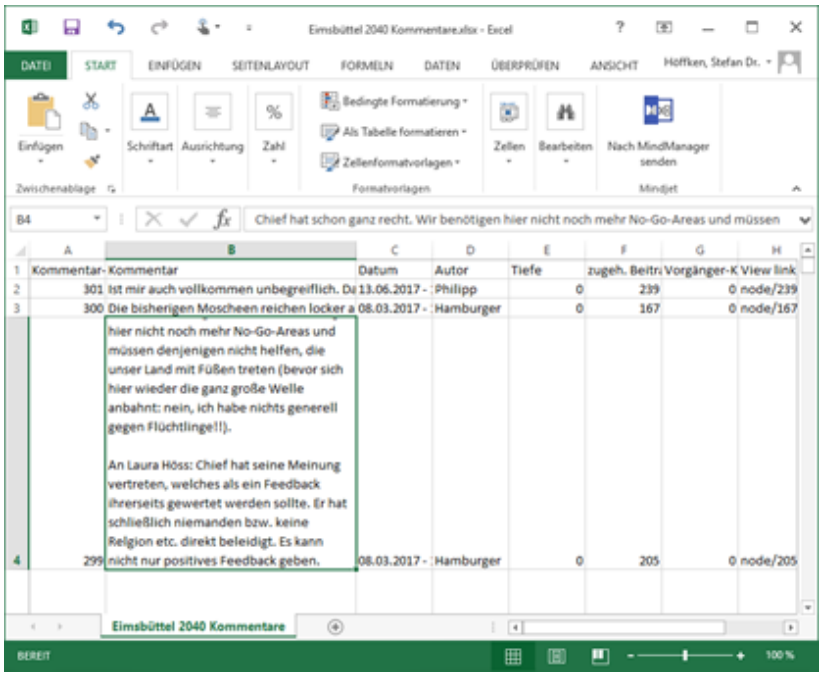
8. Final words

Through the studying of different project data we came to the conclusion that these projects often set similar requirements on data collection, however it remains difficult to classify the content of contributions with a given list of categories. The development of modern technology provides alternative ways to deal with this issue and should be considered if the circumstance allows. Also for other data fields, for example age, processing steps and project types, local specificity and project requirements apply. This proposed data model is only a first step, to implement it various technical demands should be considered, including the development of a standard API. The reference implementation in Hamburg sets a good example of how the standard can be put to use. A Europe-wide standard API would bring much more benefits for municipalities, vendors and users alike. In order to fully embrace the benefits of digital tools for the planning, a holistic approach should be taken on, this goes far beyond the better usage and exchange of participatory data, though it is a first and an important step towards that goal.

Appendix I Data Structure of existing data

Examples from Hamburg

Anonymized data from 5 projects in Hamburg was analyzed. All of the projects were led by the Urban Development and Housing Authority and for all of them DIPAS was used for the collecting of contributions. With DIPAS it is possible to export the contributions into a structured Excel file.



Example of Data-set from participatory project in Hamburg

A typical data set exported from DIPAS includes following fields.

Table: Example from the Project Radschnellweg Elmshorn[1]

Field name in German	Translation	Remark
ID	ID	
Titel	title	
Beschreibung	description	Content of the contribution
Thema	subject	The responsible person of the project can provide a list of subjects from which the participants can choose from

[1] http://geoportal-hamburg.de/beteiligung_radschnellweg_4/

Beitragstyp	type of contribution	A set of values are provided to choose from, e.g. idea, suggestion and criticism
Anzahl an Kommentaren	Number of comments	
Veröffentlicht	Published	
Autor	author	Participants can choose to submit the contribution anonymous or under a nickname
Anzahl der Bewertungen	Number of ratings	Rating was given in from of either “pro” or “against” a contribution
Durchschnitt der Bewertungen	Average of ratings	
Koordinate (Lat/Lon)	Coordinate (Lat/Lon)	
Koordinaten (GeoJSON)	Coordinates (GeoJSON)	
Link zum Beitrag	Link to the contribution	Administrator does have the possibility to take certain contribution off from the platform if inappropriate content is discovered.
Veröffentlicht	Published (yes/no)	
Latitude	Latitude	
Longitude	Longitude	

Examples from Helsingborg

For the Amended comprehensive plan for the city of Helsingborg (Stadsplan 2017) several stages of consultation took place between 2016 and 2017. City Council adopted city plan on November 21, 2017 and the decision became final 22 December 2017.
Datasets from these consultations were analyzed. Different data fields were used for each stage:

Early dialogue

- Age (*domain values: Child/youth (up to 18 yrs), Adult (19-64 yrs), Older (over 65 yrs)*)
- Sex (*domain values: Female, Male, Other)*
- Question (*domain values: Place with qualities, Place could be developed)*
- Comment (*free text)*

Tyck om Stadsplan 2017 | Kommentera utställningsförslaget | Tyck om Helsingborg | Formellt yttrande

Field: Add Delete Calculate | Selection: Zoom To Switch Clear Delete Copy

OBJECTID	Ålder	Kön	Fraga	Kommentar	SHAPE
9208	Vuxen (19-64 år)	Man	Platsen har kvaliteter	Lung och sjön oas i s...	Point
9209	Vuxen (19-64 år)	Kvinna	Platsen kan utvecklas	En trottoar för att slip...	Point
9210	Vuxen (19-64 år)	Kvinna	Platsen kan utvecklas	Lekplatser saknas för...	Point
9211	Vuxen (19-64 år)	Kvinna	Platsen har kvaliteter	Trevligt grönområde...	Point
9212	Vuxen (19-64 år)	Kvinna	Platsen kan utvecklas	Fler förskolor i detta...	Point
9213	Vuxen (19-64 år)	Man	Platsen har kvaliteter	Nära till parken, natu...	Point
9214	Vuxen (19-64 år)	Man	Platsen kan utvecklas	För höga träd som sk...	Point
10008		Man	Platsen kan utvecklas	Här måste finnas en...	Point
10009		Man	Platsen kan utvecklas	Här borde det finnas...	Point
10408	Vuxen (19-64 år)	Man	Platsen kan utvecklas	Utveckla grön koppli...	Point
10409	Vuxen (19-64 år)	Man	Platsen kan utvecklas	Farlig korsning för G...	Point
12808	Barn/ungdom (t.o.m. 1		Platsen kan utvecklas	<Null>	Point

First consultation

Informal

- Opinion (*domain values: Good idea!, I have a better idea!)*
- Category (*domain values: housing, green areas, traffic, employment and commerce, service and public space, water and flooding, other*)
- Comment (*free text*)
- Date (*automatic date*)

Tyck om Stadsplan 2017 | Kommentera utställningsförslaget | Tyck om Helsingborg | Formellt yttrande

Field: Add Delete Calculate | Selection: Zoom To Switch Clear Delete Copy

OBJECTID	Asikt_om_ide	Ämne	Kommentar	SHAPE	Skapad_datum
18006	Bra idé!	Trafik	Att öppna för biltrafik under/över järnvägen skulle avlasta Broh...	Point	2016-07-17 04:31:22
18806	Jag har en bättre idé!	Trafik	Drottningg.–Järnvägsg. skulle kunna bli väldigt mer omtyckt o...	Point	2016-07-22 09:43:07
18807	Jag har en bättre idé!	Trafik	Dessutom fungerar ju ETT körfält i vardera riktning för biltrafik...	Point	2016-07-22 09:48:28
23209	Bra idé!	Trafik	Genom att förhindra biltrafik kan man fullständigt döda centru...	Point	2016-08-03 13:31:20
26806	Jag har en bättre idé!	Trafik	Anslut avfart E6-Helsingborg S direkt till Österleden och därifrå...	Point	2016-08-17 09:22:48
30007	Jag har en bättre idé!	Trafik	Att lägga spårvagn och busslinjer här kommer att förstöra MY...	Point	2016-08-26 09:17:14
34012	Jag har en bättre idé!	Trafik	spårvägen kan gå här istället.	Point	2016-09-17 08:45:17
34013	Jag har en bättre idé!	Trafik	spårvägen kan gå utmed gc-vägen intill grönområdet. för att...	Point	2016-09-17 08:47:07
34406	Jag har en bättre idé!	Trafik	Cyklebana mellan Hasslarp och Fleninge Idag går det mycket t...	Point	2016-09-18 17:17:07
34407	Jag har en bättre idé!	Trafik	Vid busshållplatsen saknas det en bra cyelparkering. Många ine...	Point	2016-09-18 17:26:27
34408	Jag har en bättre idé!	Trafik	Här borde det finna gratis parkeringplatser för MC och moped...	Point	2016-09-18 17:30:04
34409	Jag har en bättre idé!	Trafik	Här borde det finna gratis parkeringplatser för MC och moped...	Point	2016-09-18 17:30:40

Formal

- Name *(free text)*
- E-mail *(free text)*
- Address *(free text)*
- Statement *(free text)*
- Date *(automatic date)*

Tyck om Stadsplan 2017 | Kommentera utställningsförslaget | Tyck om Helsingborg | Formellt yttrande

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete Copy

OBJECTID	Namn	E-post	Adress	Yttrande	SHAPE	Datum
4001				Är väldigt possitiv till Stadsplanen MEN tycker att...	Point	2016-06-22 18:43:15
4401				Hur kan kommunen överhuvudtaget överväga at...	Point	2016-06-22 21:29:58
4801				Läste häromdagen, att man tänker ta bort en mas...	Point	2016-06-23 08:08:34
5201				<Null>	Point	2016-06-23 08:59:09
5202				Bra initiativ med en långsiktig stadsplan. Tycker d...	Point	2016-06-23 10:08:40
5601				Tycker absolut inte att de nuvarande koloniområ...	Point	2016-06-23 20:07:48
6001				En läsbar artikel: http://www.hd.se/2016-06-25/fo...	Point	2016-06-26 09:29:00
6401				<Null>	Point	2016-06-26 10:18:00
6801				vi är kolonister på lundsbäcks kolonier sedan 40 å...	Point	2016-06-26 11:00:16
7201				<Null>	Point	2016-06-27 06:24:19
7601				Jag motsätter mig att riva Brytstugans koloniomr...	Point	2016-06-27 07:45:40
8001				Jätte bra att man skapar en långsiktig planering f...	Point	2016-06-28 16:09:06

Second consultation

- Category *(free text)*
- Comment *(free text)*
- Date *(automatic date)*

Tyck om Stadsplan 2017 | Kommentera utställningsförslaget | Tyck om Helsingborg | Formellt yttrande

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete Copy

OBJECTID	Ämne	Kommentar	Datum	SHAPE
14804	Övrigt	Gamla mejeriet kan...	2017-06-21 18:56:25	Point
13604	Trafik	Det är alldesles för tr...	2017-06-21 10:57:15	Point
13605	Trafik	Öppna Ringstorpsvä...	2017-06-21 11:02:02	Point
14004	Trafik	Öppna bussgatan för...	2017-06-21 10:59:28	Point
14005	Trafik	Med all den fruktans...	2017-06-21 11:26:25	Point
14404	Trafik	Jag ser gärna att vi (s...	2017-06-21 18:34:02	Point
14405	Trafik	Härifrån kan det bli v...	2017-06-21 19:13:32	Point
6804	Grönt	En skam om en av H...	2017-04-22 13:45:38	Point
8805	Grönt	Utmärkt med en gån...	2017-05-10 19:47:49	Point
9204	Grönt	Anser att hela nuvara...	2017-05-20 08:21:04	Point
10004	Grönt	Bevara grönområdet!	2017-06-15 18:41:56	Point
10005	Bostäder	Extremt dåligt förslag...	2017-06-16 12:32:56	Point

Appendix II Comparison of existing Open Data Categories

Germany	Hamburg	EU	Sweden	Helsingborg
Population	population	Population and society	Population and society	Population and society
Education and Science	education and science	Education, culture and sport	Education, culture and sport	Education, culture and sport
Geography, geology and basic geodata	geography, geology and geodata			
Laws and Justice	law and justice	Justice, legal system and public safety	Justice, legal system and public safety	
Health	health	Health	Health	Health
Infrastructure, construction and housing	infrastructure building and living			
Culture, leisure, sport and tourism	culture sport and tourism			
Politics and elections	politics and elections	Government and public sector	Government and public sector	Government and public sector
Social	social			
Transport and traffic	transport and traffic	Transport	Transport	Transport

Environment and climate	environment and climate	Environment	Environment	Environment
consumer protection	consumer protection			
Public administration, budget and taxes	administration budget and taxes			
Economy and Work	economy and work	Economy and finance	Economy and finance	
		Regions and cities	Regions and cities	Regions and cities
		Agriculture, fisheries, forestry and food	Agriculture, fisheries, forestry and food	Agriculture, fisheries, forestry and food
		Energy	Energy	Science and technology
		Science and technology	Science and technology	
		International issues	International issues	

Appendix III Comparison of categories from different projects

Name of project:	Stadsplan 2017	ÖP2021	ÖP2050	Elbchaussee	Grasbrook	Holstenkamp	AlegroDialog
Type of plan:	**Comprehensive plan**	**Comprehensive plan**	**Comprehensive plan**	**Traffic Planning**	**Urban Planning**	**Traffic Planning**	**Infrastructure**
City:	**Helsingborg**	**Helsingborg**	**Karlskrona**	**Hamburg**	**Hamburg**	**Hamburg**	**Region Aachen**
Link	Link		Link	Link		Link	Link
Country:	**Sweden**	**Sweden**	**Sweden**	**Germany**	**Germany**	**Germany**	**Germany**
Categories:	Housing	Housing and service	Housing		living and neighborhood	pedestrian	construction process
	Traffic	Traffic and mobility	Infrastructure	pedestrian traffic	mobility	Busses/public transport	ground
	Green	Green and recreation	Nature and culture		environment and energy	Environment & green	health
	Work and business	Work and business	Business	bicycle traffic	work and business	cars	technique

	Service and meeting places			quality of stay	public space	street space	environmental protection
	Water and flooding	Water and flooding					Other
	Other	Other	Other	automobile traffic	urban design	leisure and recreation	
				Other	social affairs	other	
						bicycle traffic	