# Democratizing New York City's urban development processes

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**Abstract**

In democratic societies, there is a strong need for a participatory process to allow people's voices to be heard. Urban planning, particularly in New York City, has a history of being top-down and state-driven, so it is essential to democratize this particular process. Current solutions to democratizing information access in this particular field have been ineffective due to the counterintuitive user experience of existing map platforms, the overuse of technical jargon, and lack of feedback platform. This report outlines the development of an Application Programming Interface (API) and a dynamic and self-updating map platform. The API is developed to collect, process and analyze data from various city planning sources. The consolidated data is used in the data visualizations within the map platform, which provides information access to citizens on upcoming and ongoing urban developments in New York City, in an engaging, interactive and intuitive manner. The platform also provides an external channel for citizens to share perspectives on these developments. This product will have far-reaching policy benefits by making citizen engagement more accessible and convenient. With enhanced participation, urban planning can be made more diverse, inclusive and ultimately effective.

Key words: urban planning, urban development, democracy, digitization, digital democracy

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# 1 Introduction

In recent decades, cities around the world have experienced unprecedented urban growth—with rapidly increasing population, built-up area and urban extent (Angel *et al*, 2016). With this growth comes higher rates of urban development, enabled by urban planning processes managed by respective city governments. However, throughout the world, urban planning has predominantly been top-down, with urban planners and technical experts maintaining systemic control. Specifically in New York City (NYC), urban planning remains top-down, developer-driven, and dominated by influential lobbies (Angotti, 2021). Citizen involvement is limited to participation in Community Boards, which are often underfunded and not fully representative of diverse citizen perspectives (ibid). This project aims to democratize the process of urban development in NYC, by fulfilling the following objectives:

1. Identify and integrate publicly available urban planning data into a single, cohesive database
2. Communicate city development plans to citizens in an engaging manner with a dynamic map
3. Provide a platform for crowdsourcing citizen feedback on these plans

# 2 Literature review

## 2.1 Citizen participation in New York City

Citizen participation is the involvement of private individuals in public decision-making processes (Baum, 2001). Public hearings in the United States remain opaque and inaccessible; attendees typically comprise either avid supporters or opponents of policies or special interest groups (Innes & Booher, 2000). In NYC, Community Boards provide a significant advisory voice on city issues (NYCCLC, 2015). Every month, Board meetings are held publicly (ibid), providing perspectives on issues such as the city's Uniform Land Use Review Procedure (ULURP). Within the ULURP, Community Boards have a strong and direct influence on the planning process (Bae, 2020).

However, this influence varies dramatically with socio-economic and demographic traits of each district. Minority residents have lower levels of substantive representation than non-minority counterparts (ibid). The COVID-19 pandemic has resulted in meetings being held online instead, increasing access to more community residents (Bonner, 2022)—showing how digitization improves access to citizen engagement platforms.

## 2.2 Benefits of citizen participation

Citizen participation is largely viewed as advantageous to city planning (Smith, 1973; Innes & Booher, 2000; Alfasi, 2003). Firstly, it builds human capacity (Bae, 2020), making citizens more public-spirited and skilful (Day, 1997; Irvin & Stansbury, 2004). Citizens are empowered when afforded the opportunity to advocate, co-produce and co-learn (Burby, 2003; Roberts, 2004). Overall, citizen participation builds social capital (Mandarano *et al*, 2010) and strengthens the definition and role of urban communities (Smith, 1973).

Advantages to governing agencies are achieved when citizens serve as a 'source of information and collective wisdom' by providing contextual knowledge (Bae, 2020: 15; Day, 1997). Together with technical proficiency from professionals, the representative perspective of ground conditions helps identify specific issues more effectively (Roberts, 2004). Incorporating citizens' 'general will' reinforces the legitimacy of planning decisions (Day, 1997: 424), building citizen trust in the state (ibid). Altogether, participatory processes are necessary for making urban planning more effective, adaptive, and stable (Smith, 1973).

### 2.3 Digital engagement in participatory planning

Recently, digital engagement has been increasingly used as a public participation tool due to its numerous benefits. Information can be conveniently communicated digitally at unprecedented speeds (Castells, 1999), enabling the involvement of citizens previously unable to participate due to temporal and geographic barriers (Mandarano *et al*, 2010). Internet use for information exchange has been shown to be positively associated with levels of civic engagement and social trust, leading to higher public participation (Shah, Kwak & Holder, 2001). Finally, digital platforms are customizable, low-cost, and easily reproducible across scales (Anindito *et al*, 2021).

One implementation is the *e-musrenbang* in Bandung City, Indonesia. It is the digital version of the conventional *musrenbang*, a public participation mechanism in urban planning (ibid). Its website allows participants from all hierarchical levels—citizens, government officials and industry partners—to view proposed developments and participate in local *e-musrenbang* meetings (ibid). It has improved the transparency and accountability of urban planning, and built citizen trust (ibid). However, it did not overcome existing barriers to participation since attendance is still differential across demographics (ibid).

Other implementations are Neighborland (United States) and Commonplace (United Kingdom), which are user-friendly digital engagement platforms that enable interactions between stakeholders and communities (Ertiö & Bhagwatwar, 2017; Civic Tech Lab, 2016). However, none have been implemented in NYC[1]. Furthermore, there is no mention of whether these platforms use self-updating datasets. Given the dynamic nature of urban planning information, static datasets that require constant human maintenance may be operationally demanding.

Altogether, the current state of citizen participation in NYC leaves much to be desired—given opaque processes with varying efficacy across neighborhoods and providing limited representation of minority citizens. This is a challenge worth addressing since effective citizen participation, especially when digitized, can engender innumerable benefits to both citizens and governments.

[1] Accurate at the time of writing

# 3 Data

Our project strives to communicate urban planning information to citizens in a convenient, engaging manner. To achieve this, relevant urban planning data sources for NYC must first be identified. Table 1 summarizes the data sources.

Table 1. Data sources for data used in this project. The source links to the webpage that hosts the data in a dashboard or in a downloadable file that may not necessarily be the final dataset used.

| **Name** | **Description** | **Purpose** | **Source** |
|---|---|---|---|
| NYC Planning Zoning Application Portal (ZAP) | Current and historic information on Land Use applications | Serves as 'future' data. The information for each project include location data, application profile, proposal details, milestones and timeline data, and public documents in PDF, DOCX or PPTX file formats. An evaluation of ZAP is available in Section 5.1. | https://zap.planning.nyc.gov/ |
| NYC Open Data PLUTO | Land use and geographic data at tax lot level | Serves as 'present' data. Provides current land use and geographic data at Building-Block-Lot (BBL) level. | https://www1.nyc.gov/site/planning/data-maps/open-data/dwn-pluto-mappluto.page |

To demonstrate urban development changes, 'present' data from the PLUTO dataset are juxtaposed against 'future' data from the Zoning Application Portal (ZAP) dataset. Comparing these allows the difference in various features to be calculated—for example, the proposed increment of buildable area or floor area ratios.

All datasets are accessed through Application Programming Interface (API) queries developed for the respective data sources, rather than by downloading the static datasets. This is because the data are continually and irregularly updated by the data engineering teams to include new projects. The API methodology will be elaborated in Section 4.

# 4 Methodology

This project involves the product development of an interactive, dynamic and self-updating map platform with a feedback channel. The methodology focuses on three main phases: data collection, data processing and web application development (Figure 1).

Figure 1. Methodology flow diagram.

**Data collection** features a landscape scan to create a meta-database of existing data sources (Section 3 'Data'). Next, strengths and weaknesses of each source will be evaluated to apply insights to the web product. **Data processing** involves merging and integrating the data from disjunct sources into a single dataset to be used in the web application. **Web application development** involves map visualization and website development to finalize our product.

## 4.1 API development: Data collection

An API is developed in Python to automatically and iteratively scrape planning data. To demonstrate planning changes, 'future' data are juxtaposed against 'present' data.

'Future' information is obtained from the ZAP portal, which provides a list of all urban planning projects in New York City. Next, ZAP projects list API and ZAP single projects API were used by iterating through each project ID in the aforementioned list. Pulled directly from the API, the data returned in a JSON format has a disorganized structure with varying file lengths and features in different sequences. Indexes from this multidimensional file were located to transform the data into a single dataframe. Universal patterns and keywords were used to identify and extract the relevant features. Altogether, 12 features for each ZAP project were extracted.

Next, PLUTO data was scraped to serve as 'present' data. The *URL.request* function was performed on the official API to query the data. Compared to ZAP, PLUTO data is easier to scrape and more user-friendly. The CSV file for PLUTO data is released on their official website, with an API to query each record.

### 4.2 API development: Data processing

**Data merging.** PLUTO and ZAP datasets were merged by reshaping both and creating a pivot table. Each ZAP record may contain more than one while each PLUTO record contains a single BBL. Thus, a ZAP record may be matched to multiple corresponding PLUTO records by BBL (demonstrated in Table 2).

Table 2. Preview of final dataset in pivot table format, showing how data records are merged between PLUTO records and ZAP entries with multiple BBLs. The first two rows have the same project ID but different PLUTO records.

| ZAP | | | PLUTO | | |
|---|---|---|---|---|---|
| **Project ID** | **Applicant** | **BBLs** | **BBL** | **Zip Code** | **Current Area** |
| 2021M0432 | Leigh Whitman | 1022030021, 1022030009 | 1022030021 | 10034 | 19984 |
| 2021M0432 | Leigh Whitman | 1022030021, 1022030009 | 1022030009 | 10034 | 59949 |
| 2020M0112 | HPD | 1010440024 | 1010440024 | 10019 | 800 |

**PDF viewer.** The API response provides data on the project's attached documents such as document category, name and file path. Using the file path, a PDF viewer was built using the PyPDF2 package, allowing the files to be accessed directly with a HTML iframe embed module instead of downloading.

**Automation with GitHub actions**. A GitHub repository was created in which API scripts were saved. An action was then created from the repository to generate a YML file, which is a text document with data formatted using YAML, a language-agnostic syntax. This YML file can instruct GitHub on script automation. This action was used to commit changes, push our script, and save the updated dataset into our repository. This GitHub workflow executes daily at 8 AM.

### 4.3 Web application development

The website presents the consolidated data in an interactive, engaging, and digestible manner through a map visualization, through the stages of data analysis, web development and proxy API development.

**Data analysis**. Spatial analysis is performed to calculate summary statistics of zoomed areas, calculated from ZAP data. This makes the map interactive by allowing users to move through neighborhoods, zoom into particular areas, and receive information on these areas. The centroid module on Turf.js, which takes one or more features and calculates the centroid using the mean of all vertices to find the center point from polygon data, was used. This center point is presented to the map using the Mapbox GL Javascript library and loading the point as a circle object. This connects the specific point to the summary statistics calculated from the ZAP API.

The summary statistics are displayed in the widge. The information is generated by data aggregation, using Mapbox function *map.queryRenderedFeatures*. The function is executed each time the user interacts with the map. The interaction will trigger a custom-written Javascript function, looping through each project on the projects list to count the project type and categorize its status. The function returns an array of GeoJSON Feature objects representing visible features that satisfy the query parameters.

**Web development**. The list of active projects, generated from the API response (Sections 4.1 and 4.2), is displayed on a widget next to the map. It includes the project's image, name, category, borough, and community district. An individual project webpage will be loaded upon clicking on a project title from the list. The webpage shows detailed information on each project. When loaded, it will pull data from the NYC ZAP API, MapPluto ArcGIS API, and the City Planning Commission's public hearing agenda. The front-end component involves deployment to GitHub and hosting on Vercel to generate and publish the static website. It is connected to the GitHub project's repository and will be updated automatically upon any changes made.

**Proxy API development.** This was built to access the API from other domains. It acts as the mediator between ZAP API and the website frontend, since the Cross-Origin Resource Sharing (CORS) protocol prevents direct access from the ZAP API.

## 4.4 Data ethics

Use of data hosted by DCP is bound by their data use policies restricting it to informational purposes only. The project complies with this policy. The processed data, comprising data from publicly accessible sources of ZAP and PLUTO, will be stored publicly on our GitHub server.

# 5 Results

## 5.1 Evaluation of existing platform

Pre-existing platforms informing citizens of NYC's urban development include the ZAP Portal, the official channel for data on rezoning projects. It also serves as our data source (Section 3.1 'Data'). The portal is intuitive and simplistic (Brewer, 2021 in Grace & Marvilli, 2021), and has increased the transparency of the planning process by providing accessible information to citizens (Richards, 2021 in ibid).

However, the ZAP portal can definitely be improved upon. It remains targeted at urban planning professionals. Its tooltip explanations are convoluted and heavily use technical jargon that requires esoteric knowledge. Using spatial points obfuscates development scale and size with respect to the surrounding urban landscape. Attached documents have to be downloaded before viewing, requiring time and storage space. They have no preview nor standard naming convention, requiring users to guess each document's contents. The comparison between current and proposed conditions is absent from project webpages, and is presented in an attached document without a standardized document name. There is no feedback platform available. Both ZAP and Capital Projects platforms contain meaningful information but having to toggle between two websites makes accessing data inconvenient.

Nevertheless, the portal still remains one of the more innovative digital solutions available. We aim to build a product that enhances the ZAP portal and further democratizes urban planning in NYC by communicating information to citizens in an engaging, user-friendly manner.

## 5.2 API output

This comprises a JSON dataset with 43 features, organized into 6 distinct categories, for each project (Table 3). This dataset is used in the website.

Table 3. Features in the final consolidated dataset, sorted by category.

| Category | Features |
|---|---|
| Location | Borough, address, latitude, longitude, BBL, block, zip code, zone map, polygon, Flood Zone |
| Owner | Owner name |
| Applicant | Applicants |
| Current details | Project name, description, public document<br>CEQR number, ULURP number, ULURP procedure, project start date<br>Land use, building area, block, built FAR, commercial FAR, facility FAR, residential FAR, lot area |
| Proposed details | Public status, ID<br>ULURP numbers, FEMA flood zone, noticed date<br>Building area, block, built FAR, commercial FAR, facility FAR, residential FAR, land use, lot area |
| Comments | *To be included upon collaboration with NYC Planning* |

### 5.3 Website

The website features an interactive web map, individual project pages, a user guide, and the hearing agenda. The former two are dynamic and self-updating with data derived from the dataset developed by our API product, which accommodates real-time changes to the data sources. Our web application is hosted at this link: in situ-project-maps.vercel.app. Figures 2–5 illustrate the website.

**Project list.** This shows projects from ZAP and Capital Planning datasets. It comprises the following: project's image to provide a preview of the development; location such as borough and community district; project name; project type, whether it is a ZAP project under ULURP, or a housing development, or demolishment project.

**Interactive web map.** The map extent changes with user input.

**Widget.** This section provides summary statistics on relevant features of the zoomed area. In Figure 3, the widget shows that this area has 31 projects, 26 of which are currently in public review. The widget's dynamism lies in how the summary statistics change with the map zoom.

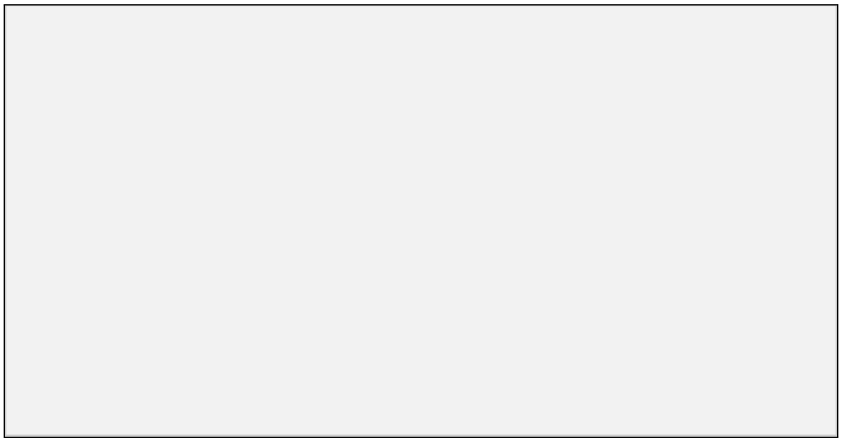

Figure 2. Interactive web map that enables zooming and navigating, showing the project list (left), interactive web map (center) and overview widget (right).

Figure 3 shows an example of an individual project webpage, accessed by clicking on a project on the project list. (Anti-clockwise from top left.) The **brief** describes the project while the **timeline** shows the current stage of the development. The **lot information** displays changes expected to occur to this particular lot. Should the project have multiple BBLs, there will be an option to toggle across BBLs to see specific changes to that particular BBL. The **public hearing** section provides a hyperlink to access the City Planning Commission comment form to leave their perspectives. The **map** shows the development's approximate size and location.

Figure 3. Individual project overview pages

The overview pages will include **improved tooltips** for each technical jargon used (Figure 4). Upon hovering over a specific technical phrase, a summarized definition will be available, accompanied by an explanatory diagram.

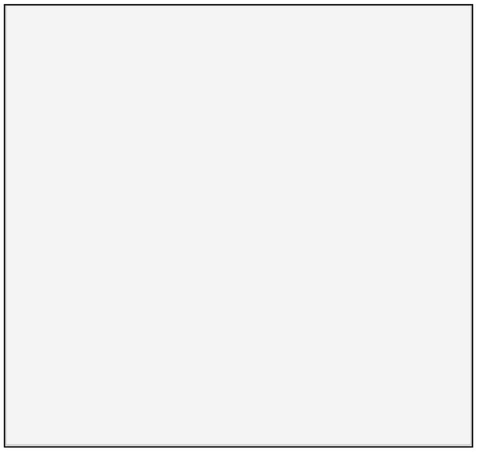

Figure 4. Improved tooltip explaining technical jargon using effective visualizations.

The **documents** tab for each project page lists all PDF documents from ZAP within a PDF viewer, allowing users to preview the document directly without downloading (Figure 5).

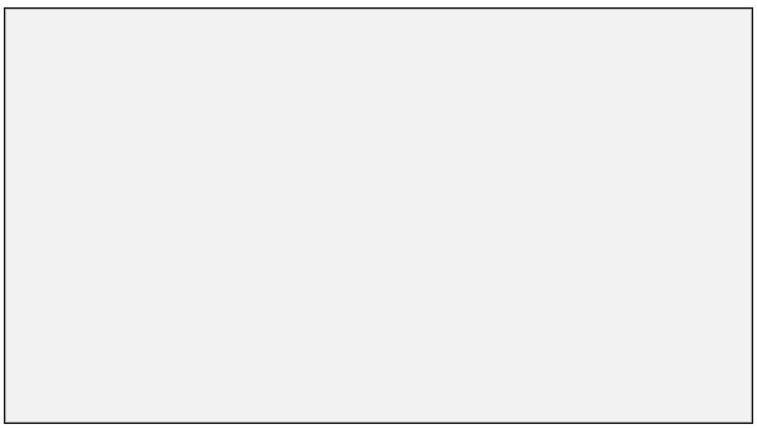

Figure 5. Documents tab with PDF viewer.

The **user guide (Figure 7)** tab includes an intuitive guide with instructions on how to participate.

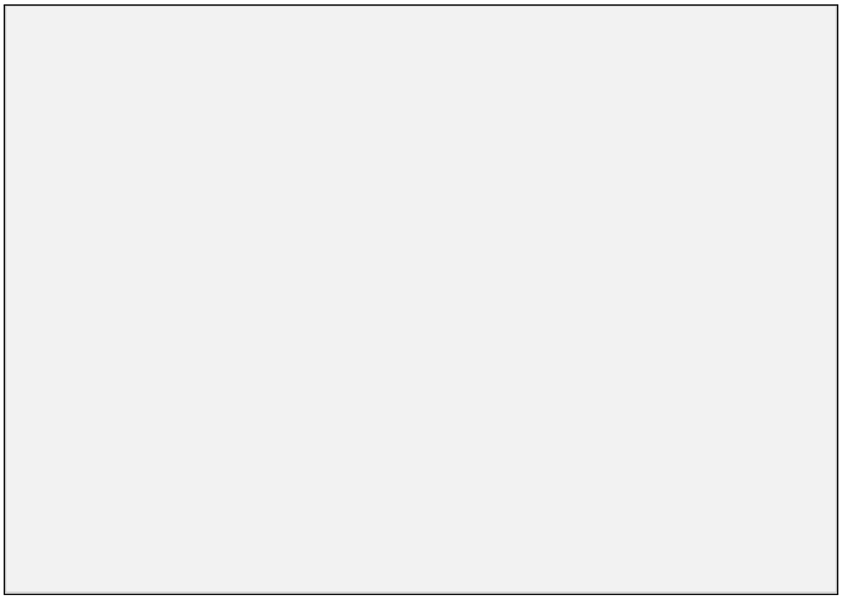

Figure 6. User guide.

## 5.4 Product evaluation

Altogether, various parts of the process fit together to democratize urban planning (Figure 7).

Figure 7. Flow diagram illustrating how the product democratizes urban development processes

Access to accurate, updated and digestible planning information through our map platform allows citizens to participate in decision-making (Neuman, 2005). Citizens can then provide informed perspectives through a feedback platform. This feedback process will encourage citizens to be more involved and invested in the planning process, encouraging stakeholder buy-in while building transparency and trust. Finally, when urban planning bodies incorporate these diverse citizen perspectives, there can be actionable change resulting from citizen voices.

## 5.5 Policy implications

The feedback platform will increase civic participation, strengthening urban communities (Smith, 1973). The convenient digital platform enables the representation of diverse perspectives by involving citizens from various demographics regardless of geographic and temporal barriers present in real-life participation (Mandarano *et al*, 2010). Citizens serve as 'collective wisdom' and an information source (Bae, 2020: 15), complementing technical expertise to holistically reflect on-the-ground experiences. Communicating urban planning information to citizens makes the processes more transparent, building civic trust and making the execution and implementation of policies more efficient and effective.

# 6 Conclusions

In democratic societies, participatory processes are critical in allowing people's voices to be heard. Urban planning has a history of being top-down and state-driven, so it is essential to democratize this. This report outlined how our team strove to democratize urban planning by developing a digital platform for information access. It serves as a map and platform for a larger diversity of citizens to share their perspectives. This product will have far-reaching policy benefits by enhancing citizen engagement to make urban planning more diverse, inclusive and ultimately effective.

## 6.1 Limitations

The product has some limitations relating to its data use and digital nature.

**Input data quality.** The datasets used are susceptible to mislabelling and missing data. During API development, some projects lacked 'future' data or stored them in inconsistent formats, which jeopardized the automation process.

**Digital divide.** Substantive representation of perspectives from certain demographics may be limited. Older adults, for example, have limited information access and technological use (Jun, 2021; Nycyk & Redsell, 2010). If they also have limited access to traditional democratic solutions, their participation in the planning process would be severely restricted.

**Benefits of face-to-face communications.** The 'unique characteristics of face-to-face communications in building consensus [and] communicating complex information' are irreplaceable (Goodspeed, 2008) by digital technologies. While our product is hosted digitally, it should complement—not replace—existing in-person democratic processes.

**Lack of partnership with official agencies.** There lacks transparency in how the online feedback amassed will be incorporated into final decision-making by NYC Planning.

## 6.2 Future work

We recommend developing a forum to host a reticulated network of participants, allowing interactions between users. Account creation can keep users accountable for their submissions. Partnering with NYC DCP, and making the product official on government platforms, can help reach a wider audience. Given the cultural diversity of NYC, providing multiple language functions can help reach non-English speaking demographics.

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