2023 Urban and Regional Information Systems Association (URISA) Exemplary Systems in Government (ESIG) Award


A. System

1. Name of system and ESIG™ category for which you are applying.


On Memorial Day 2019, a series of tornadoes swept across the Dayton metropolitan region in Southwest Ohio. They impacted hundreds of individuals and nearly 6,000 properties. The storms resulted in the issuance of states of emergency at the county and state levels, and later a Presidential Disaster Declaration.

Over the last four years, under the direction of the Miami Valley Disaster Recovery Leadership Board, MVRPC led the long-term recovery coordination efforts involving many resource management agencies and 16 jurisdictions in a three-county region. An important part of the leadership role was accomplished through the Tornado Recovery Monitoring System.
2. A letter from the executive administrator authorizing submission of the system.
June 2, 2023

URISA ESIG Award Committee
701 Lee St, Suite 960
Des Plaines, IL 60016

Dear URISA ESIG Award Committee:

On behalf of the Miami Valley Regional Planning Commission (MVRPC), I am writing in support of the 2019 Tornado Recovery Monitoring System as a worthy entrant for the 2023 Urban and Regional Information Systems Association (URISA) Exemplary Systems in Government (ESIG) Award.

The 2019 Tornado Recovery Monitoring System achieved not only a noteworthy accomplishment in regional collaboration, but – and perhaps most importantly – helped to provide a profound positive impact for those affected by the tornado disaster of 2019. The groups providing aid to the stricken were able to respond more effectively and more quickly after the deployment of this system.

As such, MVRPC strongly supports this system for the 2023 Urban and Regional Information Systems Association (URISA) Exemplary Systems in Government (ESIG) Award and appreciates both your time and your sincere consideration.

Sincerely,

Brian O. Martin, AICP
Executive Director
Miami Valley Regional Planning Commission
bmartin@mvrpc.org
3. One (1) page, or less, summary of what the system accomplishes and why it is exemplary.

In the late hours of Memorial Day 2019, a series of tornadoes reaching 166-200 MPH winds with paths nearly 20 miles long and 1,050 yards wide swept across the Dayton region. This storm system caused nearly $1 billion in damage, striking nearly 6,000 properties of which 1,200 suffered severe damage or were completely destroyed. In the months and years following this event, a newfound regional resiliency emerged. The result of which created a much faster recovery for affected people and property than what was anticipated.

What made this possible was the hard work and dedication of hundreds of volunteers, and many resource agencies and government entities in the Dayton region working together to create a new and better way to monitor and manage the recovery effort. A region-wide database of affected people and property - accessible to recovery networks, elected officials, and the public, revolutionized the way the region responded to a natural disaster.

The **2019 Tornado Recovery Monitoring System** ([the dashboards are available through the link or here: https://arcg.is/0vv191](https://arcg.is/0vv191)) as explained briefly below and detailed throughout the rest of this application was central to the expedited community recovery following this devastating event.

As a key partner in the Long Term Disaster Recovery Group, MVRPC met the challenge of undertaking a vital project that was urgently needed to speed recovery efforts. In the months immediately following the disaster, the network of recovery groups and affected jurisdictions struggled with an accurate assessment of both individuals affected by tornadoes, and the properties damaged or destroyed by them. Even worse was the ability to communicate the extent of the damage as well as any signs of recovery.

The **2019 Tornado Recovery Monitoring System** was created to solve this problem. In the case management, or individual side, records from several different recovery groups were assigned to properties in the multi-county database. At the same time, properties identified as damaged by the numerous jurisdictions affected were also committed to the database. Efforts were made to simplify the database by reconciling records from one source with records from another. Records from all sources were updated on a regular basis, keeping the data fresh. As a result, case workers for recovery groups went from working with a myriad of files and record systems to one multi-county database. Jurisdictional staffs were able to forward the results of their property damage surveys and see the results for their community alongside the results of neighboring communities. All this data was displayed in an easily accessed and intuitive manner, and more easily communicated to elected officials and the public.

Because of this system, the pace of recovery was accelerated. Recovery forecasts of as long as five to ten years were reduced to two to four. Aid was delivered more quickly to displaced individuals and communities were able to visually track their property recovery status more easily.

The 2019 Memorial Day tornados were notable in that they struck both low-income urban neighborhoods as well as affluent suburban communities. As such, there were significant disparities in the capacity and resources for these communities to respond and recover. Communities would only have fared as well as their own resources allowed, highlighting an obvious disparity. One invaluable aspect of this monitoring system is that it funneled data into a central regional repository which aided in an equitable distribution of the limited resources available. This is the type of regional thinking that is necessary in the time of a natural disaster and a mindset that MVRPC has long championed.
4. Three “user testimonials”
MIAMI VALLEY DISASTER RECOVERY LEADERSHIP BOARD

GREENE COUNTY TRANSIT BOARD 2380 BELLBROOK AVENUE XENIA, OH 45385 ATTN: W. STROUD

SUBJECT: ESIG AWARD - MVRPC 2019 TORNADO RECOVERY MONITORING SYSTEM

May 21, 2023

Dear ESIG Review Team:

In my role as Chair of the Miami Valley Disaster Recovery Leadership Board (DRLB), I am delighted to provide a strong endorsement of and testimonial in support of the Miami Valley Regional Planning Commission’s 2019 Tornado Recovery Monitoring System. The DRLB was created in March, 2020 in the aftermath of Memorial Day 2019 tornados which struck the Miami Valley Region. The goal has been to successfully guide long term recovery efforts by providing strategic leadership, oversight and transparency.

The dashboard created for the 2019 Tornado Recovery Monitoring System has been invaluable to the members of the DRLB who have used the information supplied to ensure that recovery efforts are on track and that recommendations to the Dayton Foundation for the application of recovery funds are being effectively fulfilled. Further, it has demonstrated to impacted jurisdictions that the DRLB has tracked their separate and joint needs and monitored results to ensure equitable outcomes.

The seventeen members of the DRLB representing core constituencies (county, city, business, community, academia, health, faith. foundation) have used the dashboard at regularly scheduled meetings to gage results and to suggest changes as necessary. I viewed the dashboard weekly to evaluate progress.

Sincerely,

[Signature]

W. W. Stroud, Chair
May 24, 2023

Dear ESIG Review Team,

On the evening of May 27, 2019, nineteen tornadoes ranging from EF0 to EF4 ravaged the Miami Valley damaging over 6,000 properties and leaving nearly 1,200 with major damage or destroyed. In response to the community’s need, I subsequently left my role as a senior level administrator at Sinclair College to serve as the Executive Director of Long Term Recovery Operations, and spent my next 3 years focused on helping our community become whole again.

The Miami Valley Regional Planning Commission was one of the key partners in the recovery work and their GIS team developed a set of truly extraordinary tools that we leveraged both operationally in our daily disaster case management work with tornado survivors, and as a communication vehicle to inform the public and elected officials of the status of recovery work at an individual parcel level.

MVRPC was able to matrix pre- and post-disaster aerial imaging, county auditor property records, disaster impact assessments, and disaster case management datasets so that we were able to easily assess who had been impacted and where recovery assistance or outreach was needed, and we were able track the recovery and the impact of our efforts.

I cannot stress how important these tools were in directing the efforts of hundreds of volunteers and the millions of dollars invested in recovery work, and how much being able to continuously share fresh data, intuitively displayed, allowed us to focus on the work rather than respond to individual stakeholder questions. While tornado recovery work for individuals and households was completed in 2022, we continue to use one of the tools (the case management component) today to vet survivors for an affordable housing program that we spun off the tornado recovery work.

As we’ve shared our recovery process with others including FEMA and NVOAD (National Voluntary Organizations Active in Disaster), the tools that MVRPC developed in support of the tornado recovery effort have been lauded as a national best practices. MVRPC came up with extraordinary tools in an extraordinary time and that made a tremendous impact on our region’s recovery. I cannot thank them enough for their partnership, effort, and vision.

Sincerely,

Laura Mercer  
Former Executive Director  
Miami Valley Long Term Operations Group
May 22, 2023

Dear URISA ESIG Award Committee,

It’s hard to describe the devastation multiple tornados hitting all at once can have on a community. When the Greater Dayton area was hit on Memorial Day weekend in 2019, the damage was spread across several counties with a dramatic impact on the built environment. The 2019 Tornado Recovery Monitoring System developed by MVRPC created an easy way to track progress and understand the pace of recovery.

In my role as Director of Planning, Neighborhoods & Development for the City of Dayton, I used the tool to track the status of damaged properties in the City of Dayton and understand how fast or slow recovery was progressing. If not for the system, I would not have known that a significant amount of notes collected by my Housing Division that documented the condition of properties was missing for several neighborhoods. In this way, it served to help double check the work of my team. Most importantly, the system helped the Long-Term Disaster Recovery Leadership Board, of which I was a member, to track the level of recovery across the region. It served as a tool to help us decide how and where to invest millions of dollars of donated funds to assure the greatest impact. It also allowed me to update the Dayton City Manager and City Commission on a regular basis. I referred to the system regularly and often directed Dayton residents as well as City of Dayton employees to the system to better understand progress.

As a city planner who advocates for GIS to be integrated into everything the City does, I was thrilled to see how MVRPC chose to design the system – it seamlessly covers all the necessary data and tells the story of recovery through mapping, graphics and data. It’s masterful at achieving its goal of telling the story of regional disaster recovery.

Respectfully submitted,

Todd M. Kinskey, FAICP
Director
B. Jurisdiction

1. Name of jurisdiction

Miami Valley Regional Planning Commission

2. Population served by the organization/agency

861,051 (For Metropolitan Planning Organization Boundary)

3. Annual total budget for jurisdiction

$4,267,120

4. Name, title, and address of chief elected and/or appointed official

Brian O. Martin, AICP
Executive Director
10 N Ludlow St, Suite 700
Dayton, OH 45402

5. Name, title, address, telephone, FAX, and email for contact person for system

Martin Kim, AICP, GISP
Director of Community & Regional Planning
10 N Ludlow St, suite 700
Dayton, OH 45402
937-223-6323
mkim@mvrpc.org
C. System Design

1. What motivated the system development?

Like many areas of the Midwest, the Dayton region is no stranger to the natural phenomena of the tornado and storm systems that spawn many of these at a time. Historically, the worst of these strikes have happened in fairly discrete areas with their impact localized to one community. The Memorial Day tornadoes of 2019 departed from that script, cutting a wide swath across a three-county area.

Compounding the natural disaster was the fact it disproportionately impacted low-income neighborhoods where many residents were underinsured or uninsured, as well as the largest of the tornadoes tracking through the most urban area of the region, in and around the City of Dayton.

After the initial disaster response, it became apparent that there was a critical need for an enhanced coordination for efficient and effective resource provision and recovery monitoring efforts. At that point, MVRPC, as a regional planning commission and federally designated Metropolitan Planning Organization organized and led the long-term recovery efforts involving 16 jurisdictions affected by the tornadoes in a three-county region.

2. What specific service or services was the system intended to improve?

Many different organizations were involved in the recovery efforts with each trying to provide critical and necessary resources to impacted individuals as well as to repair and rebuild damaged properties. As such, there were multiple systems and databases in place, dealing with home owners, renters, or property owners separately. These information systems were not coordinated or synchronized.

During the early stage of the recovery efforts, many agencies brought up the challenge and need to better coordinate the information necessary to get the most important aid rendered in a timely fashion – that of getting assistance to those affected by the tornado, both for individuals (displaced persons) and property owners.

This was a new challenge for the region and MVRPC since this kind of system did not exist in the area. Prior to the 2019 Memorial Day tornadoes there was no coordinated geographic database that dealt with disaster recovery management or monitoring.

MVRPC’s GIS team was brought in and was able to design the system for better data coordination. The system was to facilitate information sharing to identify and reach the individuals and properties in the most need of disaster recovery assistance, leaving no one behind.
3. What, if any, unexpected benefits did you achieve?

MVRPC has long valued collaboration and cooperation among its regional partners, and this system demonstrated the value of that philosophy. It allowed for stronger coordination between these partners and across jurisdictional boundaries, and allowed the region to fast track the recovery process.

It was anticipated that long-term recovery would take between five to ten years, but the ability to understand where resources were needed during the recovery process allowed individual recovery to finish in two years and property recovery to near completion within four years of event. This compression of the recovery timeline was a welcome surprise.

In addition, another unexpected benefit was to jumpstart Regional Resiliency Planning efforts designed to take proactive steps toward resiliency and put plans and mechanisms in place to facilitate a cohesive, organized, and successful disaster recovery.

4. What system design problems were encountered?

Incorporating data from multiple counties and communities presents obstacles for any GIS. It was particularly difficult for this system as not every community had the resources or expertise to deal with an unplanned event of this nature.

One problem was how to marry data from the Case Management System (the ‘Individual’ side that different recovery groups maintained) and data from jurisdictions about property damage (the ‘Property’ side). Having two separate databases was undesirable for many reasons, so it was decided to combine them both into one parcel based geodatabase.

The ability to upload and modify database records was one of the reasons behind using the parcel as a unifying database primary key. Certainly every property has a Parcel ID, as well as affected individuals having been affected at a particular property – this part was clear. However, recovery networks did not enter parcel numbers into their ‘Individual’ side records – they only used names and addresses. Because of this, significant efforts were made to geocode the individual records and assign them to the correct parcel.

Data submitted from communities for affected Properties varied considerably; conversely the Individual system was supplied more or less by one point of contact.
5. What differentiates this system from other similar systems?

Similar systems may work solely within one jurisdiction, making things inherently easier to deal with. This would include technical details as well as political ones. What sets this system apart from other similar systems is the collaborative nature of its development and growth as a stand-alone-system, as well as the previously mentioned combination of individual and property recovery data.

D. Implementation

1. What phases did you go through in developing the system?

Since this was a new endeavor, a period of brainstorming kicked off the process. The very first step undertaken was to learn about the case management system regarding its database structure and data acquisition procedures and sketch out the data framework. One of the most important elements identified was using parcel data as the key that would tie together both parts of the database (‘Individual’ & ‘Property’).

Next was acquiring the latest parcel GIS files along with ownership and land use information from each of the three affected counties. Each county had a different method of data acquisition as well as a different layer schema.

A schema was then created to reconcile the parcel data so that it could be used as one parcel file in the geodatabase.

As data was collected for both elements it was input into the system with either address or parcel number. If by address, this was joined to the parcel it existed in and checked for accuracy. The quality assurance process was ongoing throughout the data input phase, constantly refining the data.

Data from both sides was frequently being updated for the first several months of implementation. This meant a regular routine of assessing the new data and its origin, linking or manually updating the geodatabase with the new information, identifying duplicate records and combining them, and then publishing the data to ArcGIS Online for use in the web mapping application and the dashboards.

Once the database was completed, work began on a web mapping application. Working with an accelerated timeline presented some problems, but the typical process of application testing and refinement still needed to be followed, and that was performed over the next several weeks.

This web mapping application was developed for access by the Individual case managers – this application was the first online accessible program to interact with the GIS data (see image on the next page). This map was not a public-facing application due to privacy concern. This application, however, was a sea change for recovery
groups when it came to interacting with the data. For the first time, they could see the geographic spread and identify patterns. Each record revealed a myriad of different attributes, from both sides of the Individual/Property equation.

The ‘Case Management System & County Reported Tornado Damaged Properties’ online application

The final element was the creation of public-facing dashboards, one for the Individual Recovery and one for the Property Recovery. This allowed elected officials, community staff and the public to observe the recovery effort and its progress (see image below).

This tool split the Individual and Property databases back into two separate dashboards, as they typically had different audiences. The ability to filter by geography (e.g. by community or by county) or by attributes (e.g. renters, land use) proved invaluable to staff needing to access updated numbers.
2. Were there any modifications to the original system design? Why? What?

The system design was conceived from the beginning as a very organic, evolving product, designed to be flexible and adaptable as the project progressed. This was a distinct advantage, as opportunities to try new things and meet new needs were rather frequent. One of these first items was the need to create something that was easy to navigate, understand, and use. The just-developed web mapping application was designed for case workers and had a considerable amount of detail. It is a full-fledged GIS application, and would overwhelm a casual user. This realization ultimately led to the creation of the dashboards— one for individual cases, one for property—both of which are user-friendly and informative.

E. Organizational Impact

1. What user community does the system serve and how?

The system serves an amalgamation of different disaster recovery groups and agencies (from the Red Cross to county Emergency Management Agencies); community staff and elected officials; and the general public. An important step in long-term disaster recovery is communication on the progress of recovery and what work is left to complete. This system allowed MVRPC as the lead of Long-Term Community Recovery to advise jurisdictions which sections of their community required further aid and resources, and also communicated to the general public the progress being made. This allowed for stronger collaboration between public entities to share resources across jurisdictional lines related to recovery efforts.

2. What are the ultimate decisions/operations/services being affected?

The system facilitated what was a cumbersome process of deciding which areas of the community needed additional support for recovery efforts. This allowed a more streamlined decision-making process, while retaining the ability to make the decision a sound one. This was vital to the recovery effort.

Using this also allowed for a more equitable distribution of recovery resources to the hardest hit communities. It provided support to communities and the long-term recovery operations group to understand when recovery efforts have completed, or are considered complete. Prior to this system, it was difficult to communicate these important factors to both leadership and the public.

3. What were the quantitative and qualitative impacts of the system?

The system allowed communities and the long-term recovery group partners to form conversations and develop additional programs around how to support survivors. One example of this was establishing the *Pathways to Homeownership* program, which will eventually move away from only supporting first-time homebuyers that were displaced and long-term renters impacted by event, to promoting affordable housing opportunities in underserved communities across the region without being tied to a natural disaster. As housing is an emerging national issue, this was very timely.

In measuring recovery rate over time, it helps the region to understand the impact of the event. The widespread destruction was unmistakable—confronting this was essential to recovery efforts. Seeing recovery numbers rise periodically was a boost for all involved.

The system provided access to data on almost 8,000 records across three counties and 16 jurisdictions. Filtering capabilities allowed aid groups to quickly identify any subset of affected records they need. This provided a detailed and precise view on affected people and properties.
4. What effect has the system had on productivity?

It has resulted in a much quicker turnaround time for recovery groups to not only identify potential people and properties affected, but also to quicken the response that the recovery group can offer. It also reduced the anticipated recovery timeline of long-term community recovery from five to ten years to four years, making a profound difference to those needing the aid. In less than two years, 96.86% of individual recovery was accomplished and 93.75% of property recovery was realized in four year timeframe.

5. What, if any, other impacts has the system had?

The system allowed the region to see recovery at a larger viewpoint to ensure equitable distribution of resources. No recovery would be considered truly successful if this point were overlooked.

The system also allowed the Miami Valley Disaster Recovery Leadership Board to better understand the pathway of the tornado to recommend funding allocations from private donations to aid with restoring community gathering spaces across all counties.

6. How did the system change the way business is conducted with and/or service delivered to clients? Give specific examples comparing the old way with the new.

The old way of business would likely have isolated recovery efforts by each jurisdiction trying to scale to their own needs. This system allowed for communities to not only increase coordination with neighboring jurisdictions to aid in recovery efforts, but also ensured communities did not only focus recovery efforts in one area of a community in which they perceived to be impacted. This approach mimics ideas that MVRPC has long represented.

Fortunately, the region has not been affected by a natural disaster of this scope in some time. As a result, it is hard to compare how this changed from an old way to a new way of business.

What we can say is, this system has bolstered the region’s resiliency to future hazards and threats and will allow us to respond faster and recover more quickly as a result. Although we do not wish for a repeat, we will be better prepared for when it eventually happens.

This system also helped to promote what MVRPC has to offer its members, specifically in the realm of housing regional data. The region lacks a true regional GIS that many larger metros offer; this might yet light a path towards one for the greater Dayton area.

F. System Resources

1. What are the system’s primary hardware components?

The data was collected and manipulated on Windows desktop computers using internal network architecture. Data was primarily collected from recovery organizations and communities using Microsoft Excel, although some data was submitted as a GIS feature class. The geodatabase was eventually published to ESRI’s ArcGIS Online, residing in cloud servers.

2. What are the system’s primary software components?

The database was constructed using ESRI’s ArcGIS (both ArcMap & ArcGIS Pro) software, with data collection typically received in Microsoft Excel format.
The pertinent data was then published to ArcGIS Online, and it uses that as a portal for other agencies (and the public) to connect to the data.

The dashboards were developed using ArcGIS Dashboards, while their functionality was enhanced using ArcGIS Experience Builder. ArcGIS Online’s Web App Builder was used for the web mapping application.

The agency’s Hub Site, the Miami Valley Geo-Spark, was also used to help promote and link the dashboards.

3. What data does the system work with?

The geodatabase started with acquiring a base of parcel data from the affected three counties.

The Long Term Recovery Group collected data for individuals and properties from various county departments, surveys from affected communities, and organizations working directly with people most affected by the tornadoes. This was collected via Microsoft Excel spreadsheets and then joined or otherwise input into the geodatabase.

The information for affected individuals included address, whether they were renters or property owners, their insurance status (if known), and the dwelling type (typically single family or multi-family). For privacy reasons, the individual’s names were removed prior to sending the spreadsheet to MVRPC. As the system evolved additional fields were created to note if the case was open or closed, and if closed, when.

Information collected from jurisdictions for the property side included the parcel number and a damage assessment with any appropriate notes. As the system evolved, new fields were added. These fields included a recovery status field classifying the property as either “recovered,” “progressing,” or “no progress”; occupancy status, insurance status, land use category, and any additional notes about the property.

Eventually every record was assigned to either the individual or property side, or sometimes both in an effort to reduce duplication.

4. What staff resources were required to implement the system?

From database conceptualization to a first web application that recovery groups could use, total implementation time took four to six weeks, with three internal staff members spending most of their time on this task. The following months saw the development of the dashboard component from April to October 2020, as well as a continual refinement and updating of the system to date.

5. Comment on anything unusual about the resources used to develop your system, such as data, software, personnel and financing.

Perhaps the most unusual thing about this project was the spontaneous way it started and developed, especially as MVRPC is a planning agency, an office that is deeply rooted in long term plans and solutions. The ability to quickly shift from other projects to fully committing to an impromptu one such as this was remarkable.

The project began in February 2020 and although many work elements were interrupted by the emergence of the pandemic, the system’s development and implementation was not adversely affected.