

**PUBLIC OPINION EFFECTS ON ENVIRONMENTAL IMPACT OF CROZET
DEVELOPMENT**

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By

David Coppi

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

ADVISOR

Catherine D. Baritaud, Department of Engineering and Society

The Crozet area of Albemarle County, Virginia has experienced rapid population growth over the last few decades, seeing a population increase of 22.23% between 2011 and 2019 compared to a county average of 9.62% (Imagine Crozet, 2021) and a state average of only 7.9% (Price, 2021). This rate of growth has prompted the development and construction of new infrastructure sufficient to meet the population's needs in the form of new housing, businesses, roads, schools, and more. Many local residents are concerned about the sustainability of this growth and worry about the impacts on the community and environment. The technical project looks at a specific instance of the construction of necessary infrastructure while the STS project looks at the effects of public opinion on development as well as environmental impacts of that development.

The growth in population in Crozet has resulted in overcrowding in local schools, which has led to approximately 219 additional students being redistricted to Crozet Elementary School from the overcapacity Brownsville Elementary for the 2022-2023 school year (Albemarle County Public Schools, 2021). With this projected larger student body, an additional academic wing has become necessary along with parking, access and playground areas to support the addition (VMDO, n.d.). While the chosen design for the Crozet Elementary addition has already been finalized and is currently nearing completion of construction (Albemarle County Public Schools, n.d.), the capstone team has been tasked with the yearlong project of developing an alternative design focusing on the site parking.

The goals of the parking redesign are as follows: (a) increase the total number of parking spaces for buses and cars, up from the original 86 spaces to a total of 136 standard parking spaces and 12 designated bus spaces; (b) separate the circulation routes for buses and cars, primarily during school pick-up and drop-off times as the current design causes frequent

conflicts and inefficiencies; (c) develop a complete set of construction documents for the design that incorporates plans for site grading, stormwater management, erosion and sediment control, and utilities, and adheres to VDOT and Albemarle County standards throughout, as outlined by the Albemarle County Design Standards Manual (2015). As shown in Figure 1 below, the general site redesign has been decided with the supplemental construction documents being the next priority.

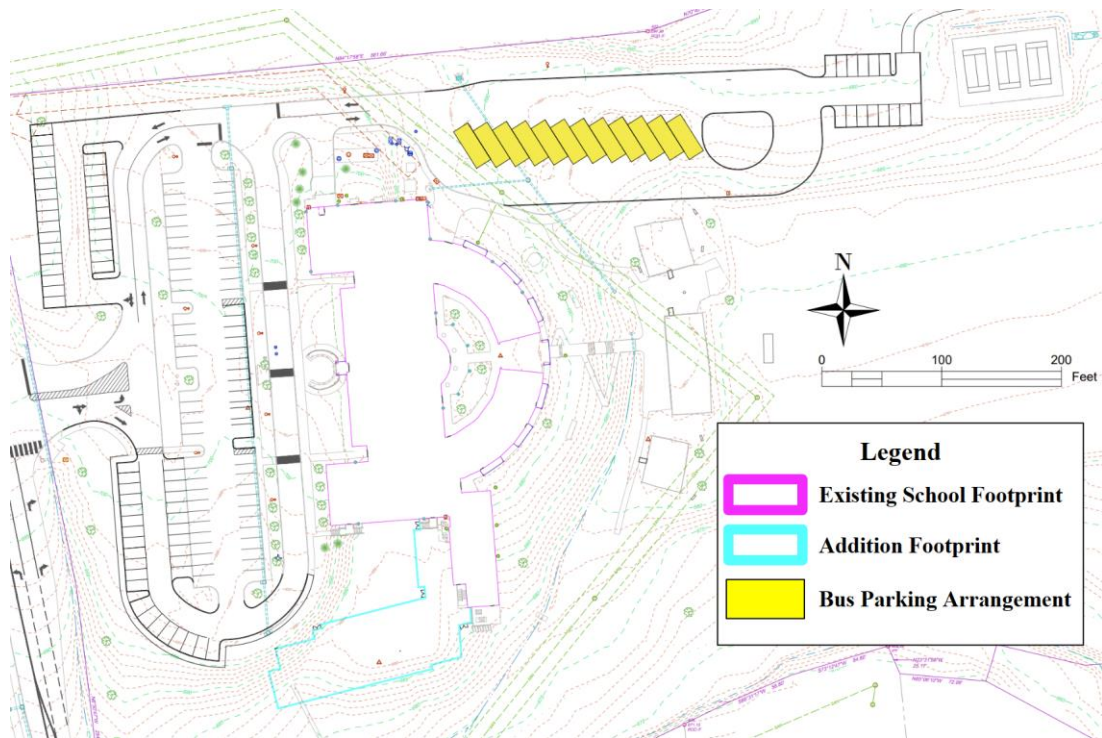


Figure 1: Crozet Elementary School parking redesign. The existing school building is outlined in pink, the additional wing in teal, and note the separated bus lot with auxiliary parking on the north-east end of the site (Coppi, 2023).

While the technical project is focused on one specific instance of necessary infrastructure development to support Crozet’s growing population, the Science, Technology, and Society (STS) research project is aimed at the development in the region as a whole. For the STS thesis, the primary research question is determining what has been the effect of public opinion and input on development plans for the Crozet area over the last fifteen years as well as looking at the environmental impacts of developments as they have been implemented. Taking this question

one step further involves evaluating whether the documented effects of public opinion had a beneficial or detrimental impact to Crozet. This research would be considered tightly coupled with the technical project as it encompasses the reason that necessitated the technical project in the first place, that being an area experiencing rapid population growth and needing to plan out additional infrastructure development.

Investigating the inclusion of public opinion on Crozet infrastructure development is important due to the concepts of citizen science and participatory design, which are discussed in more detail later in this paper. Participatory design involves involving more “stakeholders” in the design process to produce better outcomes, which in this case would mean more resident involvement would produce better results (Holter, 2022). Citizen science is a rising trend in the scientific community to create “partnerships initiated by scientists that involve nonscientists in data collection”, where the nonscientists in this case would be the citizens of Crozet. (Jordan et al., 2011, p. 1149). While typically used for data collection in environmental research, citizen science could and should be incorporated in cases of urban development to determine environmental impacts noticed by citizens to provide another tool in the sustainable design process. Observing how resident viewpoints were used in the case of the Crozet area could provide insight into how to utilize citizens in sustainable development elsewhere in the world.

The structure of the research paper will follow chronological order, starting out fifteen years ago and looking at the development in Crozet through the case study of the multiple iterations of an area master plan, the public reaction and feedback to the proposed iterations, and finally what made it into the approved drafts. This investigation will be viewed through the Social Construction of Technology (SCOT) framework developed by Trevor Pinch and Wiebe Bijker (1987). As seen in Figure 2 below, the relevant social groups direct their concerns and

priorities to the engineer, in this case those in charge of development design, and the engineer in turn should alter their design based on the relevant social groups. These social groups include any affected by development in the Crozet area, with an emphasis on the residents living there in a variety of housing types, local business and business owners, those who utilize transportation methods to travel within the Crozet area and to and from the area, and environmentalists focused on conserving the natural landscape.

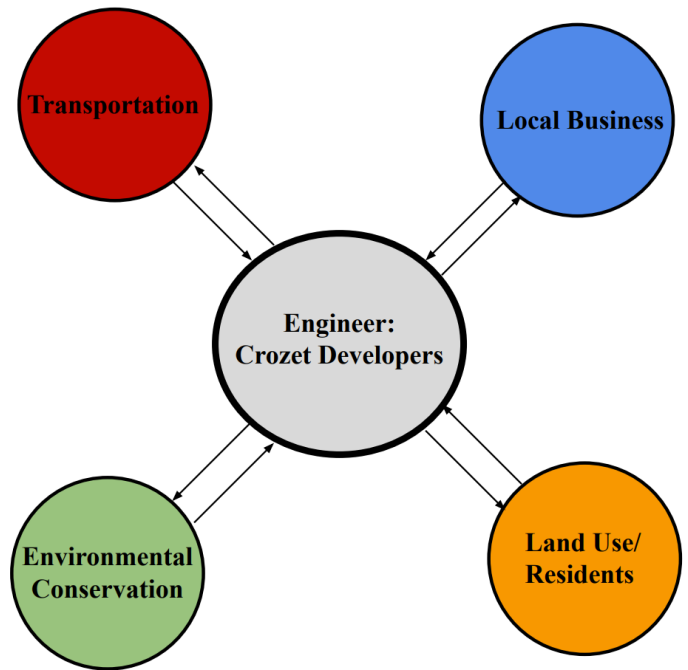


Figure 2: Crozet development SCOT model. The engineers must negotiate between the different social groups to protect each groups interests and ensure all concerns are heard and incorporated if possible. (Coppi, 2022)

URBANIZATION WITHIN CROZET AND THE WIDER WORLD

The United States have been on a consistent trend of increasing urbanization since the early 1800s, with approximately 83% of the population living in urban areas as of 2020 (O’Neill, 2022). Virginia is no exception to that trend, with 2020 US Census results showing urban regions had the highest amounts of growth over the last decade while rural regions have seen populations consistently decreasing (Price, 2021). This urbanization offers many benefits but also many drawbacks as while urban areas can be centers of innovation and production “they can also have high levels of pollution, social exclusion, environmental degradation, and cause unintended consequences outside of the urban boundaries” (Seto et al., 2017, p. 8935).

Environmental degradation is a key concern due to the fact that urban locations “consume more than 66% of the world’s energy and generate more than 70% of global greenhouse gas emissions” (Fragkias et al., 2013, p. 1). Developing countries and regions in particular are prone to rapid urbanization with little regard to sustainable growth, leading to future conditions of environmental pollution and economic downturn. These urban areas need to consider how and where they achieve “several needs such as educational facilities, transportation facilities, job, clean air, healthy potable water etc.” (Kahlor & Mahdisoltani, 2015, p. 1).

While not on the scale of a major metropolis, the Crozet area in Albemarle County, Virginia is experiencing rapid growth, being designated one of the county’s five “Development/Growth Areas” (Imagine Crozet, 2021). This growth led Albemarle County to develop the Crozet Master Plan to provide “long-range policy direction for land use, transportation, and parks and green systems for the Crozet Development Area.” (Imagine Crozet, 2021, p. 7). This document has undergone multiple iterations since its first drafting in 2004, with a second iteration finalized in 2010 and the most recent iteration approved in 2021. While final approval lies with the Albemarle County Board of Supervisors, the residents of Crozet have worked to make their voices and opinions on the master plan heard through every step of the drafting process.

PARTICIPATORY DESIGN AND CITIZEN SCIENCE

The inclusion of local residents in the planning process for new developments in Crozet would generally be seen as a positive, as it gives the people who live in the areas actually being affected a chance to voice their opinion on something that could drastically affect their lives and their families. Through the SCOT framework, it gives them a chance to influence the engineer, the development designer, instead of the influence being entirely in the hands of the engineer

making unilateral decisions based solely on their own criteria. This influence could be through the utilization of concepts such as participatory design and citizen science. While the developers and Albemarle County staff most likely did not specifically know about these concepts or set out to use them, it is worth investigating whether or not something similar was performed during the Master Plan revision process.

Carolyn T. Holter (2022), a researcher at the Responsible Technology Institute at Oxford, expresses the benefits of increased participation in the innovative process, in the forms of participatory design and responsible research and innovation, by which expanding the number of participants or “stakeholders” involved in innovation will lead to not only better outcomes but also a better process (p. 278). Including Crozet residents with a variety of priorities and backgrounds in the drafting of the Master Plan should theoretically lead to better outcomes for all involved, although there is the caveat of how much the developers let the popular opinion influence them. If the developers and Albemarle Board of Supervisors already had clear goals and criteria in mind and only included residents to discuss minutiae of the Master Plan, the innovative process would be limited.

Citizen science is another concept that seeks to use increased participation, from nonscientists, to reach better outcomes. James Borrell (2014) notes that “issues such as climate change and biodiversity loss are predicted to become more severe” in the future while worrying that “efforts to mitigate these continue to lag significantly behind needs and aspirations” (p. 111). He believes that to solve these issues “the growing global network of participatory citizen scientists will likely play a crucial role and may represent a novel and much needed model for inclusive international collaboration” (p. 112). Citizen science presents potential solutions, not only through valuable data collection but also by promoting “active engagement in policy

making, as opposed to passive engagement such as voting” (Jordan et al, 2011, p. 1149). Borrell (2014) describes one of the essential tenets of citizen science as “the willingness of citizens to participate” which could be easily attained if Crozet residents are motivated advocates for sustainable development in their community (p. 112).

HISTORY OF THE CROZET MASTER PLAN

The Crozet Community Advisory Committee (CCAC), composed of local residents and business owners, and the Albemarle County Board of Supervisors sought to revisit the Crozet Master Plan five years after its initial drafting in 2004 to determine if updates needed to be made (Fitzgerald, 2009). One major point of contention was the Master Plan’s future population estimates. The original version had planned for up to 12,000 residents by the year 2030, while new software models projected the area could see 24,000 residents instead, “alarming many Crozet residents who already were anxious about the pace of growth and approval of large new residential developments at the time” (Fitzgerald, 2009). Public input was welcomed throughout the review process, with multiple open house meetings and a questionnaire sent out in the summer of 2009 to identify components of the Master Plan that needed attention, with about 700 residents responding to the questionnaire and the CCAC receiving about 1,700 additional comments (Shulleeta, 2009). CCAC vice-chairman Bill Schrader reported that “respondents emphasized the importance of maintaining the small-town atmosphere and protecting small businesses” (Shulleeta, 2009).

One such case of maintaining the small-town atmosphere was the rejection of the proposal to create a light-industrial business park just outside the Crozet development area (Lynn and Wheeler, 2010). It was reported that “the majority of Crozet residents and the Crozet Community Advisory Council do not support the proposed business park” on the

Yancy Mills site, along with environmental concerns that “major development activity on this land would almost certainly increase the amount of sediment and other pollutants entering that [South Fork] drinking water reservoir” (Lynn and Wheeler, 2010). As seen in Figure 3 to the right, the proposed location meant the business park would be the first thing people saw traveling towards Crozet from the west on Route 250 or Interstate 64. The addition of a 184-acre industrial park did not match residents’ goals of preventing urban sprawl and promoting downtown business.



Figure 3: Proposed location of Yancy Mills business park. The large size of the park and its prominent location along the major roads of Route 250 and Interstate 64 did not match Crozet residents’ support for local businesses and a small-town feel. (Cville Tomorrow, 2008)

The Albemarle County Board of Supervisors unanimously approved the update to the Crozet Master Plan in October of 2010, with amendments that would “lower the ultimate population potential and seek to focus the community’s growth into three distinct areas” (Tubbs, 2010). This update came after two years of review from both the CCAC and Crozet residents and would plan for the area population to grow to only 12,000 residents by 2030, instead of the potential 24,000 which had been heavily opposed by the community. The update also shut down any further review of the potential for the Yancy Mills business park, as it had been judged to be outside the scope of the master plan and again opposed by a majority of residents.

The Crozet Master Plan did not receive another five-year update in 2015, with the CCAC reporting that the county “has said they are not equipped to resource that effort now” (Dodson, 2016b). Rather than wait an additional five years to get started on the next update, CCAC members recommended that they sponsor public meetings on potential changes to the master plan as well as disseminate a community survey to residents, similar to the one sent out in 2009. It took approximately six months for the survey to be finalized and the CCAC released the survey online in May of 2017 (Wrabel, 2017). The community survey received about 700 responses from residents who had been directly sent the survey and almost 600 responses from residents who were volunteer opt-ins, although the Albemarle County Planning Commission declined to support a resolution based on the survey results, feeling “uncomfortable supporting a resolution that the commission did not write” (Wrabel, 2018). During this time period in between revisions, CCAC members also brought up concerns about new development also bringing overcrowding in the public school system with one member quoted as saying ““Within five years, it is projected that 50 percent of our students will be in overcrowded schools in our county” (Dodson, 2016a). This worry would prove to be well founded, with several hundred students being redistricted between elementary schools for the 2022-23 school year necessitating the technical project of the Crozet Elementary school redesign (Albemarle County Public Schools, 2021).

Despite the grassroots effort from the CCAC, work on the update process would not really get started until fall of 2019 with “a series of community conversations and workshops about the update” followed by public “focus-area and topic-specific workshops [beginning] in January and will be informed by community input during the first round of meetings” (Daily Progress, 2019). From these meetings, “community members gave input on the area's centers

and what services and uses those centers should have, as well as the boundary of the development area and whether it should be expanded” with most residents being opposed to expanding the development boundary (Wrabel, 2020).

Collaboration between the CCAC and residents with the Albemarle County Planning Commission began to break down with the Planning Commission’s unwillingness to incorporate gathered resident feedback into a revised draft to present to county officials, telling the CCAC “that making revisions to the draft is a lot of work, that they received feedback that having multiple drafts out in the public was confusing and county staff just wanted to hear the Planning Commission's feedback before they went in and made another round of revisions” (Wrabel, 2021a).

Another serious point of contention emerged when the Planning Commission proposed a new land use category in the current draft plan – Middle Density Residential – that would allow for smaller, more affordable units at a density of six to 24 units per acre (Wrabel, 2021a). Many members of the CCAC felt this middle density was too high for maintaining Crozet’s small-town feel especially in the more rural neighborhoods, which led the Planning Commission to lower the proposed units of the Middle Density Residential down to 6 to 12 units per acre, with up to 18 units per acre to accommodate additional affordable housing (Wrabel, 2021b). Their hope was to avoid urban density levels but still provide the possibility for future affordable housing in the area that would not be restricted to one specific location. The CCAC’s vehement disapproval prompted members of the county Board of Supervisors to remind the CCAC they are not a legislative body and that they hope that “anybody that's participating, especially on any CAC, understands that it's advisory, and just because you voted a certain way doesn't mean staff ... are in any way, shape or form obligated to follow that, other than to take the input” (Wrabel, 2021b).

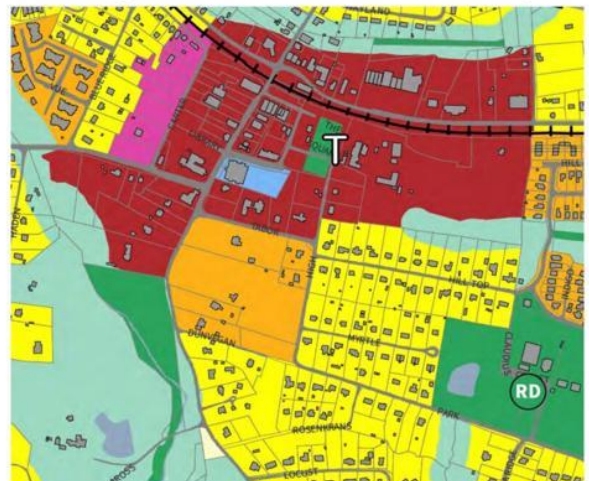
While CCAC members felt slighted by what they perceived as the Board of Supervisors swooping in and taking control of a project the CCAC had been working on for years, they were able to come to a compromise on changing seven land parcels on the future land use map from Neighborhood Density Residential (three to six units per acre) to Middle Density Residential (six to 12, potentially 18, units per acre) with an example change seen in Figure 4 below (Wrabel, 2021c, 2021d). CCAC opposition was further mollified with the fact that “anyone who wanted to develop these properties or portions of them would still have to go through a rezoning process, ... the Board of Supervisors would review any proposed development with the area's master plan in mind” (Wrabel, 2021d).

Proposed Land Use Change

Current: Neighborhood Density



Proposed: Middle Density



Neighborhood Density Residen- Middle Den- sity Residen- Downtown Neighborhood Mixed Public Land Green Systems

Figure 4: Proposed land use change map of downtown Crozet. This map shows a potential parcel that could be rezoned to the new classification of Middle Density Residential, which would allow for more affordable housing to be built on that land. (Wrabel, 2021d)

Along with several other areas being reduced from Urban Density Residential to Middle Density Residential, the Planning Commission approved the drafted Crozet Master Plan in

September 2021 for recommendation to the Albemarle County Board of Supervisors. (Wrabel, 2021e). The Board of Supervisors then approved the updated Master Plan in October, making it “part of Albemarle's Comprehensive Plan, which guides the county's long-term vision for land use and resource protection” and rezoning process but not being a codified law (Wrabel, 2021f). This Middle Density Residential classification would come into play as early as January 2022 with local developer and architect Vito Cetta requesting a rezoning to build a 157-home development at that new density (Wrabel, 2022).

ANALYSIS OF INCLUSION OF PUBLIC OPINION AND FEEDBACK

The residents of Crozet were able to provide their opinions and feedback on the drafting of the Master Plan in multiple fashions for the 2010 and 2021 iterations. These included a host of public meetings, including town halls, public hearings, forums, workshops, and open houses occurring throughout the revision process. With all these options for input Albemarle County staff seem to have been genuine in giving residents “opportunity to weigh in on whether officials are focusing on the right components of the Master Plan, as they work to update the plan (Shulleeta, 2009). This is most evident in the mass community surveys occurring in 2009 and 2017, with each survey receiving hundreds of responses from local residents about what parts of the Crozet Master Plan were most important and should be considered during revision. Local residents also had a determined advocate in the CCAC, whose membership was filled by those invested in their community and having both the time and motivation to put in the necessary work. They helped organize a number of public meetings and got the ball rolling on the 2017 community survey when it became apparent there would be no 2015 update to the Master Plan. This would be a prime demonstration of citizen science with “the willingness of citizens to participate”, where motivated residents looked to collect as much accurate data as

possible to aid the scientific process, in this case the Master Plan revision process (Borrell, 2014, p 112). Although the lack of subsequent approval from the Board of Supervisors could have been detrimental in that it would not “reinforce the participants’ belief that their behavior can contribute to the conservation effort.” (Jordan et al, 2011, p 1153).

Overall, public opinion did have a positive effect on development and environmental impacts in Crozet in the 2010 revision of the Master Plan with the approval of a 2030 estimated population of 12,000 residents as opposed to the estimate of 24,000 residents. While software models and data showed that the area could potentially support that higher population, there was also the potential that trying to reach that goal within only 20 years could kill off future economic and residential interest, with residents not wanting “the downtown to become a dead area” (Fitzgerald, 2009). Environmentally, the area would require twice as much infrastructure to handle double the population which would mean an even higher rate of urbanization for the area, and thus would experience more of the environmental impacts of urban areas such as emissions and pollutants. The resounding public repudiation of the proposed Yancy Mills business park also seems to have made a positive impact by preventing additional urban sprawl that could have reduced downtown business traffic and increase sediments and pollutants entering the local watershed and drinking water (Lynn & Wheeler, 2010).

It could be argued that the public input of residents and the CCAC was less impactful and not always taken into account for the 2021 iteration of the Master Plan. The community survey in 2017 was used by the CCAC to “help form a resolution reaffirming the guiding principles of the current Crozet Master Plan” (Wrabel, 2018). However, county staff declined to officially take the resolution into consideration, citing concerns over the wording of the questions as well as whether or not all the data was being properly presented. CCAC and resident opinions

were seemingly ignored again when the Albemarle County Board of Supervisors introduced the Middle Density Residential land use category, something residents were initially opposed to and had not even been considering as an option. The CCAC felt slighted at first but came to a compromise when the Board elaborated on how this new land use density would allow for the creation of additional housing in the area at a more affordable price, while still remaining less dense than full urban housing which would reduce environmental impacts. This is an example where public opinion was not helpful, as it could be seen as residents being too worried about maintaining small-town feel and Not in My Backyard (NIMBY) concerns to be open to methods allowing for future growth in the area and opportunities for lower-income households.

FINAL VERDICT, FUTURE WORK, AND RECOMMENDATIONS

The opinions, feedback, and input from local residents did have a noticeable impact on the revision process of the Crozet Master Plan, which meant residents also had an impact on development in the area as a whole. In general, their input also had a positive environmental impact by pushing for smaller-scale developments as opposed to mass urbanization, although it could be said this was due to residents wanting to maintain a small-town feel aesthetic as opposed to being chiefly concerned about the environment. If the aesthetic viewpoint did not happen to align so well with a more sustainable design viewpoint, it is possible Crozet would have instead experienced a much different development process. The case of Crozet development could be used as a model for other locales based on the level of opportunity for participation in the design process, but if the residents in those other locales do not have strong opinions towards sustainable development it is possible there would be more negative environmental impacts from the influenced designs.

Assuming that the Crozet Master Plan does get updated regularly every five years, future work would include continuing to observe what revisions to the Master Plan are made in the next few iterations and how closely that conforms to the input provided by local residents. It would also be important to track any new developments that get constructed within the Crozet area over the next fifteen years, as well as observe any noticeable environmental impacts from infrastructure that has recently been built based on the previous iteration of the Crozet Master Plan, whether that be pollutants, or emissions, or energy usage. A larger data set over a longer time frame will help draw a more accurate conclusion about how public opinion influences development and environmental impacts.

A recommendation to the CCAC and Albemarle County Board of Supervisors would be to specifically incorporate the concepts of participatory design and citizen science into their revision process. Residents were included throughout the drafting of the 2010 and 2021 iterations, but specifically tasking them as scientists to gather data for revisions to the Master Plan would help create better outcomes for current and future residents of Crozet. Citizen science and “the process of participation [are linked] with increasing scientific literacy, earth stewardship and the resulting overlap with future policy in society” (Borrell, 2014, p 115). With increasingly ubiquitous communication technologies such as cell phones and social media, it is easier than ever to share and disseminate knowledge. This could be both top-down, sharing scientific know-how to train citizen scientists, as well as bottom-up, by making it easier for citizen scientists to gather and share collected data. Introducing new communication avenues for Albemarle County officials and Crozet residents could have a major positive impact on their ability to collaborate in future iterations of the Crozet Master Plan.

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