

How Much Will It Cost to Survive Climate Change? Detailed Estimates and AI Imagery for Constructing Climate Change Communities in the Virginia Highlands

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How to cite this paper: Hirschman, E.C., Bourgin, W., Chapman, D., Creque, B., Davis, L., Dickson, D., Lane, A., Latapia, I., Meade, J., Montes, L., Rogers, N., Sturgill, N. and Williams, E. (2025) How Much Will It Cost to Survive Climate Change? Detailed Estimates and AI Imagery for Constructing Climate Change Communities in the Virginia Highlands. *Journal of Environmental Protection*, 16, 593-626.

<https://doi.org/10.4236/jep.2025.166031>

Received: April 29, 2025

Accepted: June 27, 2025

Published: June 30, 2025

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Abstract

This research presents construction time and cost estimates for Climate Change Haven Communities built in the Virginia Highlands. AI imagery is used to represent residential, administrative, business/professional and shopping structures that would be appropriate for the Appalachian Region of the United States. These estimates and structural designs may be applicable to the construction of similar installations in Europe and Asia, as well as other areas of the Continental United States.

Keywords

Climate Change Haven Communities, Cost Estimates for Climate Change Response, AI Images of Green Construction

1. Introduction

Human migration due to climate change has become increasingly common and urgent in the years post-2020 [1]-[8]. Yet very few studies have attempted to estimate the financial costs and time frames required for relocating people within their home countries or in the countries to which they desire to migrate. Arriving at such estimates is made especially difficult by the lack of existing architectural models for the new communities to which migrants would be re-located. Our study focuses on the Appalachian Region of the United States which has been identified as a primary area continuing to have a habitable climate over the next

several years [6].

However, as the map below in **Figure 1** indicates, this area will also experience dramatically increased rainfall, which must be addressed using flood control measures prior to the arrival of new inhabitants. Thus, not only will new ecologically-sound communities be required, they also must be constructed in areas of the Appalachian Region which can be made safe through the use of flood control measures. Our study addresses these requirements, as well as presenting AI generated designs for new communities (termed Climate Change Haven Communities) that are ecologically-sound and capable of being built within the 5-year time frame now confronting not only the United States, but much of the globe.

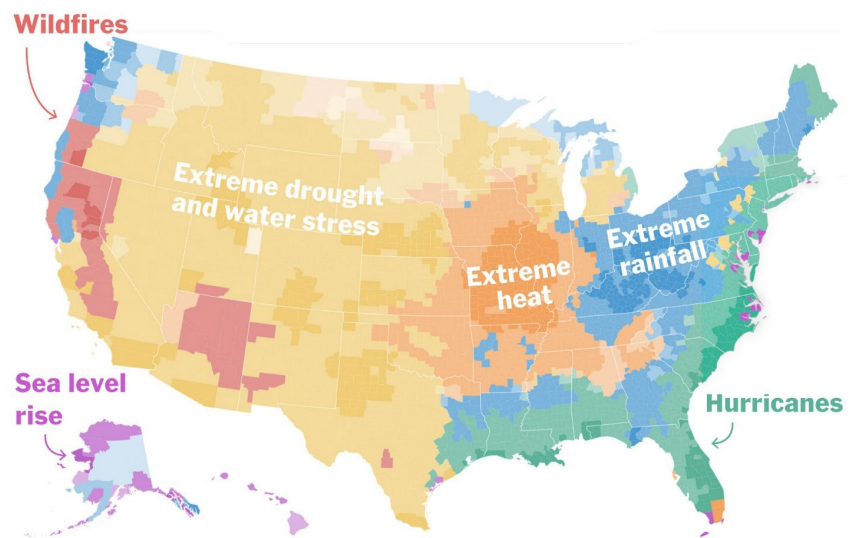


Figure 1. Map of current climate change in the United States.

2. How Much Will Surviving Climate Change Cost?

One of the most immediate financial burdens stemming from the arrival of climate refugees is the cost of emergency relief and humanitarian aid. When a climate-related disaster strikes, affected communities require immediate essentials such as food, clean water, shelter, and medical care. Several studies have attempted to outline the parameters of these costs [8]-[13]. However, few studies have directly addressed the time and economic costs required for re-settling migrants by constructing new housing and support systems. An important exception to this pattern is the recent study by Clements [13]. An excerpt from his study is given below:

“While the UNFCCC classifies climate migration under adaptation, few adaptation resources are devoted to migrants’ needs. Based on humanitarian aid expenses for other kinds of migrants, I estimate it could **cost around \$7000 per person** to help climate migrants to rebuild their lives. Most climate migrants who abandon their homes receive little support from the international community.... They are often likely to arrive in communities that are already stressed, and, as

their numbers increase, they may more often give rise to political unrest. If...climate migration and other effects of climate change cause already fragile polities to break down, waves of refugees are likely to be released.... Not only budgetary requirements, but also the institutional challenges in implementing coherent programs are formidable. While large-scale climate migration once appeared as a distant possibility, **today it is upon us** (emphasis added).”

Because of these uncertainties, calculating climate change migration and relocation costs globally will likely be impossible; there are simply too many factors in play simultaneously to arrive at valid estimates. Even in the United States, internal climate change migration cost projections have been very difficult to calculate [11] [14] [15].

The best option for the United States, therefore, is likely to focus climate change migration cost calculations on transferring specific US regional populations to specific climate change protected sites (*i.e.*, Climate Change Havens) within the United States. By generating **localized estimates** for specific Climate Change Haven regions of the country, more accurate construction time and building costs can be calculated and appropriate funding sources can be identified.

Over the past few years, a series of studies have discussed the construction of Climate Change Haven Communities in the Appalachian Region of the United States, as well as areas with similar terrain globally [16]. The US state of Virginia has been a focal point of this discussion, but research has also described climate change response efforts being undertaken in the European Union and China [16]. This existing research includes some preliminary time/cost estimates, but these may be subject to error due to rapidly evolving global economic events and the speed of climate deterioration [17] [18]. Millions of people, together with their businesses, livestock and crops, now need to be re-located to safer areas of the planet, primarily in the Northern Hemisphere. They will need to be housed, fed and employed in these new locations. Some countries, most notably China and some members of the EU, are making strong progress in creating habitable places for their migrating citizens to live [19].

However, the United States is not among them. Indeed, the current US Federal Government Administration has denied the reality of climate change, reduced national funding for restoration after current climate-caused events (e.g., hurricanes, floods, fires), and encouraged the increased use of known pollutant energy sources, e.g., coal, petroleum, natural gas [20]. Thus, the United States will likely find a large proportion of its population, especially in the Southern and Western regions of the country, in need of relocation by 2030.

Climate Change Haven Communities

The concept of Climate Change Haven Communities was introduced three years ago [16]. The original article described the basic structures needed to create fully-functioning communities of 25,000 to 30,000 people in areas of Appalachia that would remain largely immune to the destructive effects of climate change. The

Appalachian Mountain Range, especially the region from Western Pennsylvania south to Northeastern Tennessee and Western North Carolina, is forecast to remain relatively stable in weather patterns over the coming decades, even as climate change severely damages other areas of the United States, especially the Western and Southern portions of the country [21]. However, extreme rainfall events are expected to increase and will necessitate the construction of flood control dams throughout the Appalachian Region, prior to in-migration by US residents in climate-impacted areas [16].

The proposed Climate Change Haven Communities will be constructed of eco-sustainable, modular materials and located near existing Appalachian towns (usually those having 1,000 to 5,000 residents). This will ensure the pre-existence of key governmental, educational and business services on the site prior to the inflow of new residents. Current residents in each planned Climate Change Haven Community site will need to be prepared in advance for the inflow of Americans from endangered areas of the US. This can be accomplished through the use of communication campaigns stressing the value of incorporating the newcomers into their community, e.g., the town tax base will be multiplied, the educational system will be upgraded, and the new neighbors will be bringing their businesses with them, boosting employment opportunities for current residents. In short, it will be a positive future for all parties.

As prior articles have described, Climate Change Haven Communities will be powered primarily by ecologically-sound, hydro-power generators placed on the Appalachian Region's many lakes, rivers and reservoirs. These can be supplemented with wind turbines and solar panel installations, if needed [16]. This energy-efficient plan will eliminate the use of coal, natural gas and other carbon-based fuel sources within the Climate Change Haven Communities throughout Appalachia. Topographical areas that are currently, or were formerly, damaged by mining can be rehabilitated through the use of switch grass (*Panicum virgatum*) within 3 to 5 years [16].

The Climate Change Haven Community model is believed applicable to other well-watered, mountainous regions in the Northern Hemisphere. For example, Canada, Scotland, Northern Ireland, Scandinavia, Central Europe, Northern Europe, and China should be able to implement all or at least many features of the Climate Change Haven Community model [16]. The plan should also be viable in the Andean Region of South America. Unfortunately, the African Continent, much of the Middle East, Southeastern Europe and Southeast Asia do not appear to have the terrain and climate necessary to support Climate Change Haven Communities.

3. What Will It Cost to Save Lives

Many of the countries whose terrain and climate are appropriate for constructing Climate Change Haven Communities have wealthy and well-educated populations, e.g., Switzerland, Austria, Germany, Sweden, Norway, China, the United

States, and Canada. But their political systems may act to assist or hinder actual construction efforts. As reported in earlier research, China currently appears to be undertaking the most effective efforts to transfer its population, agricultural and business sectors to safe, self-sustaining communities [16]. Canada has recently placed emphasis on combatting pollution and environmental degradation, but has not yet made plans to transfer any of its population to safer areas of the country [22].

Many members of the European Union are actively reducing climate-endangering emissions, as well as attempting to restructure their immigration policies to accept arrivals from former colonies in endangered areas, e.g., North Africa [23]. However, most EU countries have not yet begun constructing Climate Change Haven Communities for their own citizens or colonial-era migrants. It is also questionable whether the most climate-threatened members of European Union (e.g., Spain, Italy) will have the financial resources needed to move large segments of their populations to Climate Change Haven Communities in safer areas of their countries.

As noted above, the United States' current administration has very little interest in responding to environmental issues and is therefore unlikely to provide funding for constructing Climate Change Haven Communities. The US economic system is based primarily on entrepreneurial capitalism, thus the best (and likely only) source for funding will be **commercial real estate developers in the private sector**. The primary questions they will have when considering proposals to build Climate Change Haven Communities are: **“How much will it cost and how long will it take?”**

To answer these questions, detailed plans were developed for building Climate Change Haven Communities in the 36 mountainous counties in the state of Virginia called the Virginia Highlands. The present study presents detailed cost and time projections for constructing these communities in 9 representative counties. Detailed plans were also developed for the remaining 27 counties and are available from the first author.

The Climate Change Haven Communities developed for a given county include **AI-generated images of the residential, administrative, recreational, health services and business parks appropriate for that county**. These images are embedded in existing landscapes for each county. Some of the AI-generated images may be appropriate for use in other parts of the United States and globally which have similar topography. We turn now to a discussion of the use of AI images to assist the design of sustainable development projects based on recently published studies.

4. The Use of Artificial Intelligence to Develop Climate Change Response Structures

Beginning in the early 2020s researchers in the architectural, engineering and public policy academic communities realized that there would very soon be a need for

buildings of various types that could withstand the effects of climate change; these effects included flooding due to excessive rainfall, extreme heat, sea level rise, tornadoes and hurricanes [24]-[35]. Collectively, these researchers noted that climate change was proceeding much faster than was predicted during the 2010-2020 time period and there were few existing models that adequately addressed the construction challenges that would very soon become prevalent across the globe.

In pragmatic terms, there was no time left to experiment with constructing actual buildings and testing them for climate change durability. Existing buildings, especially those in large urban areas, needed to be retro-fitted quickly to withstand climatic challenges, and new building sites and designs needed to be investigated that could house migrants both from within and outside of the country. These three-dimensional visual models could be presented to governmental agencies and/or private contractors and used to forecast time and cost estimates. Because neither the governmental agencies nor the private contractors had ever constructed buildings requiring climate resistant specifications before, the designs would have to be flexible and capable of rapid alteration, if climate deterioration began to evolve even more rapidly. This certainly has become the case in 2025.

The obvious choice for creating these flexible designs was Artificial Intelligence which could allow the proposed buildings to be quickly altered in terms of size, shape, construction materials, foundation requirements and energy sources, as the environment shifted in various ways [24]-[34]. A review of this literature is given below.

The excerpt from Luccionni *et al.* [26] below is typical of the early stages of using AI to stimulate climate change effects at the beginning of the decade. Their AI model focused on demonstrating to individual citizens that they could take meaningful actions to mitigate the impact of climate change on their own homes.

“The computer infrastructure behind this website will enable the following to happen: based on an (home) address entered by the user, the system will query Google Streetview to fetch a first-person image of the address, then send this image to the Masker, which will create a mask of where the flood should be drawn. The mask will then be provided to the Painter model along with the original image, **outputting a visualization of what a flood could potentially look like at that particular location....** We will accompany the image with accessible explanations of the science behind climate change, as well as examples of personal and collective actions that can be taken to reduce our environmental footprint...”

However, it is likely that few citizens, especially those hesitant to acknowledge the reality of climate change, would be willing to explore what might happen to them in the case of a serious climate event. Later AI models focused their attention on actively demonstrating how existing and future buildings could be built to withstand climate change impacts.

In 2022 the first comprehensive review article was published [24]. This work examined the existing state of knowledge on the use of AI in creating environmentally-sound, “green” buildings. Focusing on 76 research articles, the authors

identified knowledge gaps as well as future research directions of AI-in-GB. The primary topics found were “digital twins and AI of things; blockchain; robotics and 4D printing; and legal, ethical, and moral responsibilities of Artificial Intelligence in Green Building”. While this review is of strong value to researchers, it did not address the primary concern underlying response to climate change, that is, how can existing communities be protected and, if they cannot be adequately prepared for climate change impacts, where can the inhabitants be moved.

A later article (“Integrating machine and deep learning technologies in green buildings for enhanced energy efficiency and environmental sustainability” [31]) found that integrating meteorological data with historical energy usage data improved climate event forecasting. The authors also demonstrated the advancements made in estimating the future impacts of climate change on building energy consumption by using advanced AI models. As they concluded: “The study’s future directions will concentrate on addressing the limits of climate data resolution and period to increase the accuracy of energy consumption estimates. Longer periods and higher temporal and spatial resolution of climate information added to the ASHARE-884 dataset will improve its ability to capture long-term climatic trends as well as localized temperature changes. Moreover, integrating meteorological data with large historical energy usage data improves forecasting model calibration and validation considerably. Future research endeavors can leverage the current foundation to enhance the precision, dependability, and adaptability of models for energy consumption prediction...”

Another study [31] studied **green building engineering designs** and evaluated them with regard to sustainability of energy consumption, as well as the utility of AI in creating energy efficient designs. “The goal of the study was to assess the potential for AI in Green Building Construction (AI-GBC) to lower utility costs and carbon emissions.” This research, together with the findings from later studies, was put into a very recent review article [31], which effectively summarized the present state of the field:

The Benefits:

Reduced energy consumption: This results in energy-efficient structures inherent within the building since the systems are designed and developed using AI simulations for cost-efficient services on the building’s utility bills.

Lower carbon footprint: In energy conservation, AI makes a more significant contribution by lessening carbon emissions in the environment through the functioning of the building.

Improved occupant comfort: A well-planned, designed, and organized natural light and ventilation system is very effective in resulting in healthier and optimum living or working conditions.

Lower operational costs: Thus, energy and water preservation are associated with lower consumption and, therefore, lower utility bills and operational costs for building owners.

Energy optimization: Using AI, the power consumed when mining, refining,

transporting, and installing various construction materials can be determined. This enables architects to choose materials with low embodied energy, thus substantially reducing the environmental impact.

Durability and maintenance: AI can estimate qualities such as the more lasting period or the frequency of maintenance of the materials used. This element breaks down the pitted and weathered cover and selects long-lasting materials that require low maintenance to limit the earth’s worth span.

Closing this discussion, a 2024 article describes the various systems which AI design can evaluate prior to the actual construction of the building [35]. A building based on these principles is shown below (**Figure 2**).

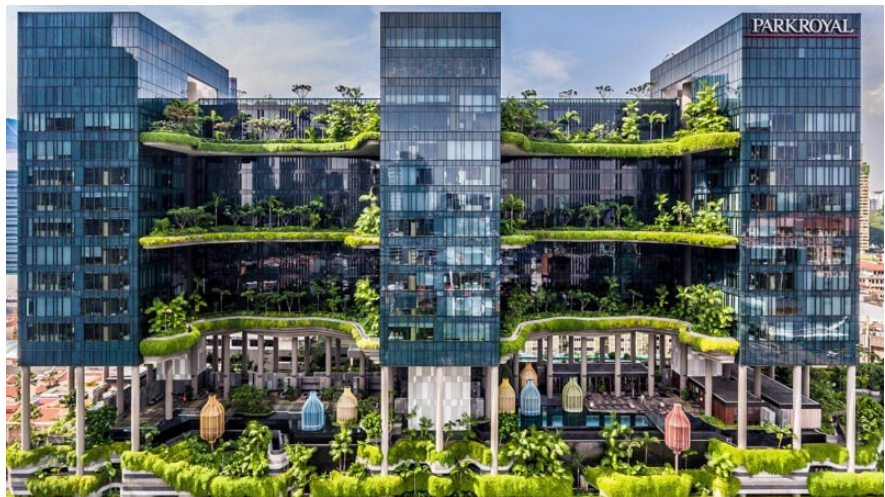


Figure 2. Metropolitan design building image.

5. Applying Current Construction Cost Estimates and AI Imagery to the Virginia Highlands Climate Change Haven Region

The 36 counties included in the Virginia Highlands Region range from Lee County in the extreme southwestern portion of the state to Frederick and Clarke County in the northernmost area of the state. A complete listing is given in **Table 1**.

Table 1. Virginia highlands counties.

Frederick
Clarke
Warren
Lee
Scott
Washington
Dickenson
Wise
Buchanan
Allegheny
Bath Rockbridge

Continued

Montgomery
 Bedford
 Franklin
 Tazewell
 Smythe
 Wythe
 Montgomery
 Franklin Botetourt
 Highland
 Augusta
 Nelson
 Wythe
 Pulaski
 Craig
 Botetort
 Augusta
 Shenandoah
 Clarke
 Albemarle
 Highland
 Grayson
 Bland
 Giles

The discussion below provides detailed construction estimates for nine of the Virginia Highlands Climate Change Haven counties. These were chosen because they represent a variety of topographical and climatic features characteristic of the Virginia Highlands Region; therefore, their projected costs should be applicable to other areas in Appalachia, the US, and countries that have similar climatic and topographic areas. It is hoped that these may serve as a rudimentary benchmark to encourage more rapid global investment in this vital construction effort.

Because this region will become more susceptible to flash flooding in the future, flood control dams and bridges must be constructed before the Climate Change Haven Communities are built. The construction cost and time estimates provided here for flood control dams and bridge development are based on published information available from the Virginia government agencies cited in the discussion. They are subject to change, likely in the upward direction, as the threat of climate change becomes more palpable and the demand for flood control projects in the Appalachian Region intensifies. Conversations were held with real estate agencies and construction companies in the 36 Virginia Highlands counties; these

confirmed an increasing interest by persons and companies in climate-endangered areas of the United States to move to the Virginia Highlands Region. Thus, it is incumbent on those currently living in the Virginia Highlands Region to prepare for their arrival.

6. Climate Change Haven Construction Plans for Dickenson, Wise and Buchanan Counties

These three counties have a history of both shaft and surface coal mining. Although most mines are no longer operating, topographical remediation using varieties of switch grass will be needed in some areas prior to the construction of Climate Change Haven Communities. These terrain conditions are typical of other areas in the Central Appalachian Region that have current and prior mining activities. They can also be found in Britain, Canada, and China. The Climate Change Haven analysis that was developed focuses first on the water resources available in a given county; this will include an examination of existing dams and flood control efforts and land availability for the construction of Climate Change Haven Communities.

The discussion next considers the estimated costs and time-lines required for developing each county to support Climate Change Haven Communities. Citations to sources, often governmental and public record documents, are provided throughout the discussion. The analysis then turns to the construction of the potential Climate Change Haven Communities, themselves. Real estate development company estimates, county documents, and Virginia state government documents are cited to derive the estimated construction time and cost for building the Climate Change Haven Communities. The intent here is to show real estate developers, county officials and Virginia state legislators that the Climate Change Haven Community plan is viable, cost effective, and will enhance the welfare of the county and state, as a whole. To our knowledge, this is the first time such detailed data have been compiled in the United States.

6.1. Dickenson County (Dickenson Co WebGIS, webgis.net/VA/Dickenson)

The county currently has around 14,000 residents, most of which are white and Protestant. The primary towns are Clinchco, Clintwood, and Haysi; each of these can be developed into a Climate Change Haven Community with 25,000 to 30,000 residents using available land nearby.

Existing Dams and Water Resources

- John W. Flannagan Dam and Reservoir: Built between 1960 and 1964, this dam offers recreational opportunities and is an essential flood control structure. Notwithstanding its advantages, the dam is incapable of producing hydro-power.
- The Flannagan Hydroelectric Project (2023): The Federal Energy Regulatory Commission granted Tivis Branch Hydro LLC a preliminary permit to inves-

tigate the viability of a 1.44 MW hydroelectric project at the John W. Flanagan Dam. Installing four 360 kW turbine-generator units inside the dam's intake tower is part of the plan.

6.2. Wise County (Wise County, VA | Official Website)

- The county currently has 36,000 residents of which over 90% are white. The primary towns are Appalachia, Big Stone Gap, Coeburn, Pound, St. Paul, Wise and the independent city of Norton. Due to the county's ample water resources, each of these could be developed into a Climate Change Haven Community.
- Dams and Water Resources
- North Fork Pound Reservoir: Finished in 1966, this reservoir's main purposes are water supply and flood control. It currently lacks facilities for producing hydropower, but could be upgraded to do so.
- Energy DELTA Lab Initiatives (2023): Three industrial sites are being developed by the Energy DELTA Lab in partnership with Energy Transfer and Wise County officials:
 - Meade Fork Site: A 300-acre plot of land close to Pound that is being evaluated for a solar energy facility in collaboration with Sun Tribe Solar and The Nature Conservancy.
 - Junction Site: A 2,000-acre area close to Appalachia that is intended to be developed as a mixed-use project integrating conservation, clean energy production, industry and agriculture.
 - Bullitt Site: A 4,000-acre plot of land that could be used for several energy-related projects.

6.3. Buchanan County (Buchanan County, VA-WebGIS)

- The county currently has 20,000 residents; over 90% are white. The primary town is Grundy which has enough water access to support a Climate Change Haven Community.
- Dams and Water Resources
- Flood Control Measures: Stream clearance and channel improvements are currently the only flood mitigation measures. On reclaimed mine lands prospects for the development of renewable energy sources and hydroelectric power generation are being investigated. The Energy DELTA Lab, for example, is building several industrial sites in nearby Wise County, such as the 300-acre "Meade Fork" site close to Pound. A solar energy facility is being considered for this location in partnership with Sun Tribe Solar and The Nature Conservancy.

A 99-acre plot of land on the boundary between Dickenson and Wise counties is being prepared for renewable energy projects by the Wise County Industrial Development Authority. Because of its accessibility to infrastructure and available land, this location presents opportunities for energy development.

Strategies such as pumped storage facilities are being considered. In pumped storage, water is moved to a higher reservoir when the electricity demand is low and released to produce electricity when the demand is high. Dominion Energy currently is assessing the possibility of building such a facility in Buchanan County.

- Existing Flood Control & Hydro Infrastructure:
- Water supply and flood control are current functions of the John W. Flanagan Dam in Dickenson County.
- The reservoir behind the dam is 1,145 acres and 250 feet high and could be an excellent source for hydro-power electricity.
- Potential for Renewable Energy & Hydroelectric Projects:
- In Wise County, Energy DELTA Lab is working on development projects, including a 300-acre solar project at Meade Fork.
- Wise County IDA Site (99 acres): Ideally situated for energy projects on the Wise-Dickenson border.
- Innovative Hydro Solutions:

Wise, Dickenson, and Buchanan counties are striving to utilize renewable energy projects, such as solar installations and cutting-edge hydroelectric solutions such as pumped storage, especially on reclaimed mine lands.

1) Hydroelectric Generator

- Small-scale hydropower: Small, run-of-the-river hydropower systems, typically with a capacity of less than 10 MW, can cost anywhere from \$1,000 to \$5,000 per installed kilowatt. It could cost anywhere from \$1 million to \$5 million for a 1 MW system.
- Medium- to large-scale hydropower: larger projects (over 10 MW) typically cost between \$1,500 and \$3,500 per installed kilowatt. Between \$150 million and \$350 million could be spent on a 100 MW plant.

Factors to Consider: Site preparation (land, access roads, etc.), Equipment (turbines, generators, etc.), Permitting and regulatory approvals, Transmission lines and infrastructure.

2) Flood Control Dam

- Small-scale dams: The cost of a smaller flood control dam can range from \$1 million to \$10 million, contingent on its location and size.
- Large-scale dams: The cost of major dams, such as those with a larger reservoir or more intricate design, can range from \$50 million to \$500 million or more.

Factors to Consider: Engineering and design, Construction materials (concrete, steel, etc.), Environmental mitigation and impact assessments, Operation and maintenance costs, Land acquisition.

Total Estimate:

A rough combined estimate to include both a flood control dam and a hydroelectric generator would be: Small project: \$10 million to \$50 million, Medium to large project: \$100 million to \$500 million+.

Real Estate Development Costs in Wise, Dickenson and Buchanan Counties

- 1) Land Acquisition: Cost per acre: ~\$23,900 (varies by location and terrain),

Site Preparation: \$5,000–\$20,000 (clearing land, grading, utility access).

2) Home Construction Costs, Average Cost per Square Foot: \$155 (standard finish). 1,500 sq ft. Home: ~\$232,500.20 Homes (~1,500 sq. ft. each): ~\$4.65 million.

3) Key Construction Components:

- Foundation: \$20,000 - \$30,000 per home (based on slab vs. basement).
- Framing: ~\$50,000 per home (including labor and materials).
- Exterior (Roof, Siding, Windows): \$30,000 - \$50,000 per home.
- Interior Finishes: \$50,000 - \$100,000 per home (kitchen, flooring, paint).
- Systems (Plumbing, Electrical, HVAC): \$30,000 - \$60,000 per home.

4) Infrastructure & Utilities

- Road Construction: \$300,000 - \$600,000 (depending on length and materials).
- Water/Sewer Installation: \$200,000 - \$500,000 (municipal hookup vs. well/septic).
- Electric & Gas: \$100,000 - \$250,000 (transformers, meters).

5) Permits & Fees

- Building Permits: \$1,000 - \$2,000 per home.
- Impact Fees (Public Services): \$5,000–\$10,000 per home.

6) Miscellaneous Costs

- Landscaping: \$5,000 - \$15,000 per home.
- Community Amenities (Park, Playground, etc.): \$100,000 - \$300,000.

Total Estimated Cost for 20-Home Community

- Land & Site Prep: ~\$500,000 - \$1 million.
- Home Construction: ~\$4.65 million.
- Infrastructure & Utilities: ~\$600,000 - \$1.35 million.
- Permits & Fees: ~\$120,000 - \$240,000.
- Miscellaneous: ~\$200,000 - \$500,000.

Grand Total: \$6.07 million - \$7.74 million (for 20 homes).

Improvements to Counties:

Wise County

(1) Elam Farm Industrial Site Development: The Elam Farm property is being developed by Wise County to increase the size of the Lonesome Pine Regional Business and Technology Park. Creating a 65-acre, shovel-ready industrial site that can accommodate a range of projects, such as data centers and advanced manufacturing. To support the early stages of this development, the Virginia Coalfield Economic Development Authority (VCEDA) approved a \$1 million funding package that includes a \$300,000 loan and a \$700,000 grant. An additional \$1.7 million was awarded to advance this project through the Virginia Department of Energy's Abandoned Mine Land Economic Revitalization (AMLER) program [36].

(2) Establishment of an Economic Development Authority (EDA): Town officials have started creating an Economic Development Authority to boost downtown development and improve relations with the University of Virginia's College at Wise. A strategic plan for economic development was completed in December 2022 with the help of a \$18,600 federal grant. The plan lays out growth strategies

for the upcoming ten years, such as connecting Wise's downtown to the university. The goal is to create a lively and dynamic community that appeals to locals, tourists, and businesses.

Buchanan County, Virginia:

Corridor Q: Route 460/121 Poplar Creek Phases A & B: Significant infrastructure improvements are being made in Buchanan County as a result of the Poplar Creek Phases A and B of Route 460/121, also referred to as Corridor Q. To increase regional transportation efficiency and safety, these projects entail constructing a new four-lane, limited-access highway with a bridge over the railroad. The fact that construction is actively taking place indicates that the county's transportation infrastructure is being modernized [37] [38].

Industrial Park Expansion: Buchanan County is adding a new shell building to its industrial park to draw manufacturing firms and spur economic growth. This roughly 20,000-square-foot facility is primarily intended to serve manufacturing companies looking to relocate to the area. The county will be positioned as a competitive site for industrial development once construction is finished.

Dickenson County, Virginia:

Water Transmission Main Replacement and Infrastructure Upgrades: Buchanan County Public Service Authority received \$10 million from the Virginia Department of Health. Upgrading the water transmission main to an 18-inch ductile iron main, installing hydraulic surge control measures, and replacing the 16-inch asbestos cement with two new 4,000 gallon-per-minute pumping stations with emergency generators are some of the improvements [37].

Sourwood-Hales Branch Transmission Line Rebuild Project: The transmission line system that serves Buchanan County, Virginia, and McDowell County, West Virginia, as well as neighboring Dickenson County, is being upgraded by Appalachian Power representatives. Around 11 miles of the current 138-kilovolt transmission line between the Sourwood Substation and the Hales Branch Substation will be rebuilt as part of the Sourwood-Hales Branch Transmission Line Rebuild Project. The objective of this project is to support residential and commercial energy needs by improving the region's power grid's capacity and dependability [39].

Estimated construction timeline for these additions.

Component	Estimated construction time
Housing & town revitalization	3 - 4 years
Co-working spaces & business support	2.5 - 3 years
Trail/outdoor facility enhancements	2 - 3 years
Arts & culture programming	2 - 3 years
Overall completion goal	Within 3 - 5 years total

The black box shows flood control dams and hydroelectric generators (see **Figure 3**).

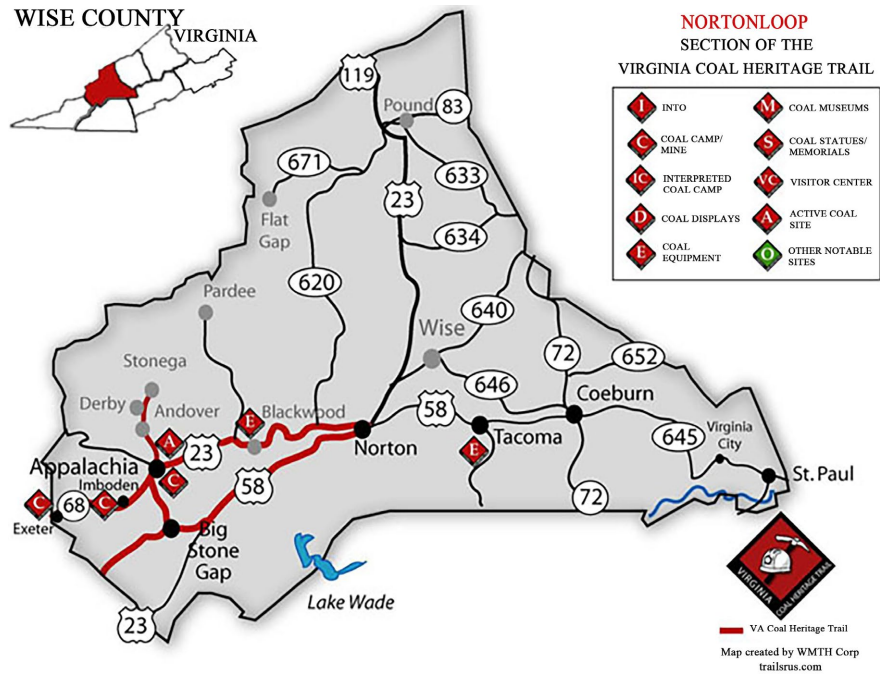


Figure 3. Map of Wise County, VA.

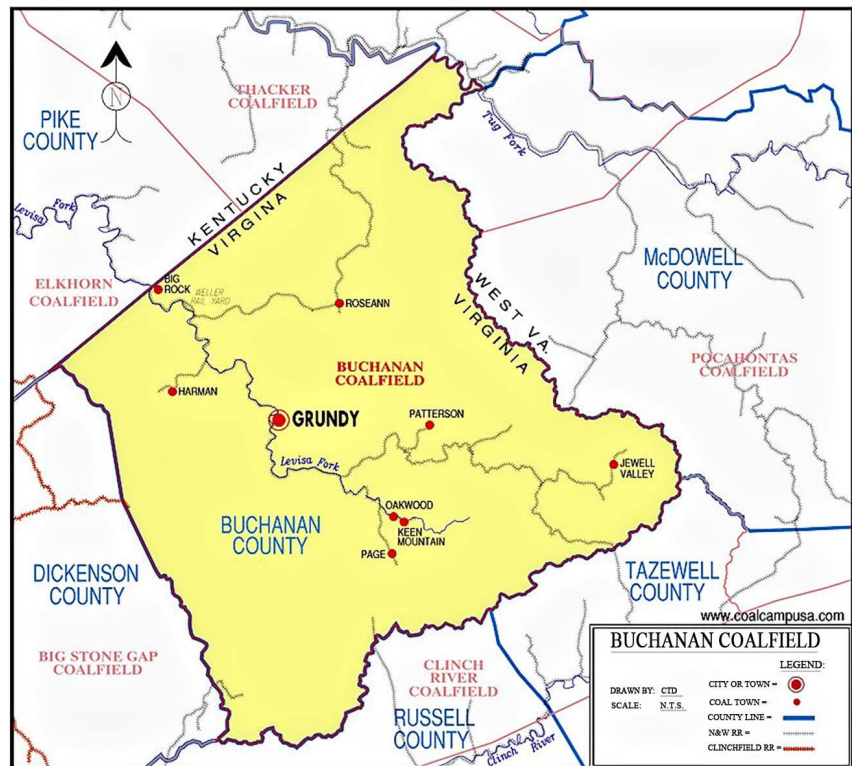


Figure 4. Map of Buchanan County, VA.

The black box represents flood control dams and hydroelectric generators; the blue box shows the best locations for Climate Change Haven Community construction (see Figure 4).



Figure 5. AI-generated image of a flood control dam.

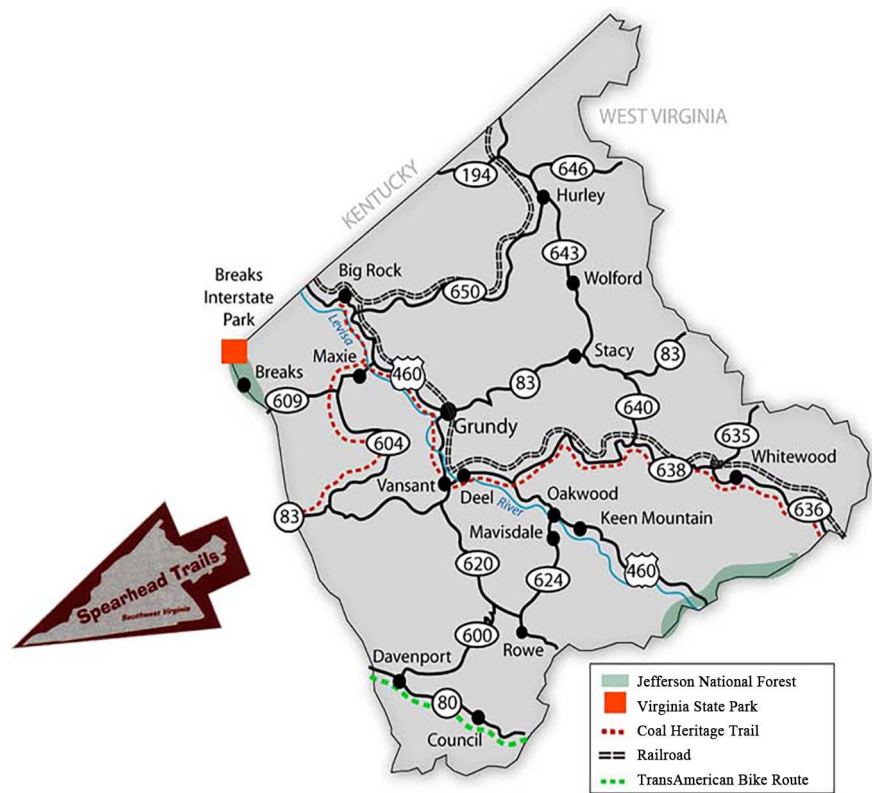


Figure 6. Map of Dickenson County, VA.

The black box stands for flood control dams and hydroelectric generators, the blue box shows the best location for Climate Change Haven Community construction (see **Figure 6**).

The flood control dam image shown in **Figure 5** shows the type of structure best suited for placement in the Dickenson, Buchanan and Wise counties discussed above.

The image in **Figure 7** above shows an elementary school (and possible child-care center) placed on the terrain of Wise County. This same structural format can be used in Dickenson and Buchanan counties, as well.



Figure 7. Elementary school complex, AI generated.

The image shown in **Figure 8** below depicts a business and professional office complex appropriate for the terrain in Wise, Dickenson and Buchanan Counties. As described earlier in the section on technological advances in Artificial Intelligence, this entire structure will be equipped with electrical and communications systems powered by eco-sustainable sources, primarily hydro-power generators, but also solar and wind sources. The windows are constructed of light-reflecting glass and the construction materials themselves are modular and composed of eco-recyclable materials. Note that the electric bus route encircles the building and that no individual cars will be needed to travel to and from the site. This same eco-material-usage and transportation system is also depicted in **Figure 7** elementary school complex.



Figure 8. Below business complex, AI generated.



Figure 9. Below upscale residential condominium complex.

Figures 9 and 10 depict an upscale residential condominium complex and a community park and shopping complex. These are built into the surrounding mountainous terrain that is typical of the Virginia Highlands. These designs would be appropriate for similar sites in the United States (e.g., Washington state) and also in countries such as Scotland, Canada, Switzerland, Sweden and Northern China. By building into the mountainous landscape, energy costs are significantly reduced. However, flood control systems must be installed around the exterior of the buildings to prevent water entry during heavy rainfall events. The AI models discussed in an earlier section can be used to design these flood control systems.



Figure 10. Community park and shopping complex, AI generated.



Figure 11. Administrative services and medical office park, AI generated.

The image in **Figure 11** above shows a building complex appropriate for the Climate Change Haven Community Administrative Services, as well as also serving as a model for community medical centers in Dickenson, Buchanan and Wise counties. This will be especially useful in case of community emergencies when police, fire, rescue and medical services are needed. This complex will also house the local AM radio emergency-alert station for use when internet, cell phone and cloud-based services are unavailable due to weather conditions or cyber-attacks.

It is important to note the encircling highway system which will be used to transport residents by electric buses to their destinations within the Climate Change Haven Community. The communities are designed to eliminate the need for individual automobiles, dramatically reducing toxic emissions.

Plans for Constructing Climate Change Haven Communities in Lee, Scott and Washington County, VA (Construction estimates are analogous to those for the three counties discussed above).

- Lee County

Population: Approximately 21,982 as of 2022.

Towns: Jonesville, Pennington Gap, St. Charles. All are suitable sites for Climate Change Haven Communities.

Healthcare: Lee County Community Hospital.

Flood Areas: Along Powell River and tributaries (see FEMA maps).

Politics & Demographics: The county has a predominantly White population.

- Scott County

Population: Approximately 21,576.

Towns: Gate City, Clinchport, Duffield, Dungannon, Nickelsville, Weber City. All are suitable for Climate Change Haven Communities.

Flood Areas: Specific flood-prone zones are not detailed in the available sources; consulting FEMA flood maps is recommended for precise information.

Politics & Demographics: The county has a predominantly White population.

- Washington County

Population: Approximately 53,935 as of 2020.

Towns: Abingdon (county seat), Damascus, Glade Spring. All are suitable for Climate Change Haven Communities.

Flood Areas: Specific flood-prone zones are not detailed in the available sources; consulting FEMA flood maps is recommended for precise information.

Politics & Demographics: The county has a predominantly White population.

1) Washington County Flood Control

- Install new automated flood gauges with real-time monitoring.
- Total estimated time: 6 - 12 months.

2) Zoning & Buyouts

- Purchase and demolish 10 current high-risk floodplain properties.
- Convert land into green space/wetlands to absorb future floodwaters.
- Total estimated time: 12 - 18 months.

3) Annual Inspections & Dredging

Regular sediment removal from Wolf Creek.

Inspect and repair levees and drainage structures annually.

Total estimated time: 3 - 6 months per cycle.

4) Retention Pond Construction

- Build a 20-acre retention pond upstream near the confluence of Wolf Creek and South Fork Holston River.
- Designed to store excess runoff and release it slowly into the creek.
- Total estimated time: 24 - 36 months.

5) Flood Control Dams:

- Placement: Targeting regions along major rivers, streams, and creeks in Washington County, such as the Holston River, North Fork Holston River, and Watauga River.
- Time Estimates: 3-7 years depending on the size of the dam as well as external conditions, weather, etc.

Hydroelectric Power Generators:

- Placement: Site selection focuses on areas with sufficient water flow and elevation changes to generate power efficiently, e.g., Holston River, North Fork Holston River and Watauga River.
- Time Estimate: 1 - 3 years.

Economic and Life Opportunities.

- Affordable Housing: One of the most significant advantages of relocating to these three counties is their affordability. Lower property costs enable residents to purchase larger homes or land without the financial burden common in high-cost metropolitan areas.

Business Relocation

Lee, Scott, and Washington counties offer several business parks and infrastructure options suitable for companies. Here are some current sites:

Lee County

Constitutional Oaks Industrial Park: Shown in **Figure 12**, the park is located along US 58 near Rose Hill, it offers ample space for various business operations.



Figure 12. Business Park.

Scott County

- Scott County Regional Business & Technology Park (SCRBTTP): Located in Duffield, this 65-acre park provides 55 developable acres, fully equipped with access roads, water, sewer, broadband communications, and essential support services. It's specifically designed for technology-dependent firms, offering high-bandwidth, redundant services at competitive pricing.
- Riverside Development: Situated in Weber City, this area includes the Riverside Technology Building, located within both an Enterprise Zone and an Opportunity Zone, offering potential tax incentives.
- Duffield Premier Data Center Site: Designated as one of twelve Premier Data Center Sites in the TVA Region, this location is ideal for data-centric businesses.
- Washington County Enterprise Zone: This zone offers incentives such as the Virginia Real Property Investment Grant, which provides grants to property owners, developers, or tenants investing in real property within the zone. Lee, Scott, Washington counties are fostering growth in advanced manufacturing, technology, and agriculture. Business-friendly environments, access to incentives, and lower startup costs make them attractive to entrepreneurs.

Constructing Apartments and Homes

EcoHaven Apartments with modular construction for Climate Change Haven Communities in Scott, Lee, and Washington Counties, VA:

1) Modular Design & Construction

- Prefabricated Units: Quick, cost-effective assembly using sustainable materials (local timber, recycled steel).
- Customizable Layouts: Adaptable sizes from studios to multi-bedrooms.

2) Energy & Water Efficiency

- Solar & Geothermal: Solar panels and geothermal heating/cooling for energy efficiency.
- Rainwater Systems: Water collection and recycling in each unit.

3) Climate Resilience

- Elevated Platforms: Protection from flooding.
- Storm & Fire-Proof Design: Reinforced materials for extreme weather re-

sistance.

4) Community Spaces

- Shared Hubs: Modular community kitchens, co-working areas, and gardens.
- Local Food Production: Greenhouses or vertical farming units.

5) Mixed-Income Housing

- Affordable Units: A mix of income levels in modular units.

The red box in **Figure 13** below indicates a desirable area for placing Climate Change Haven Communities; note the abundance of water sources for installing hydro-power generators. The projected costs are the same as those for the three counties discussed in the first section since the topography is very similar.

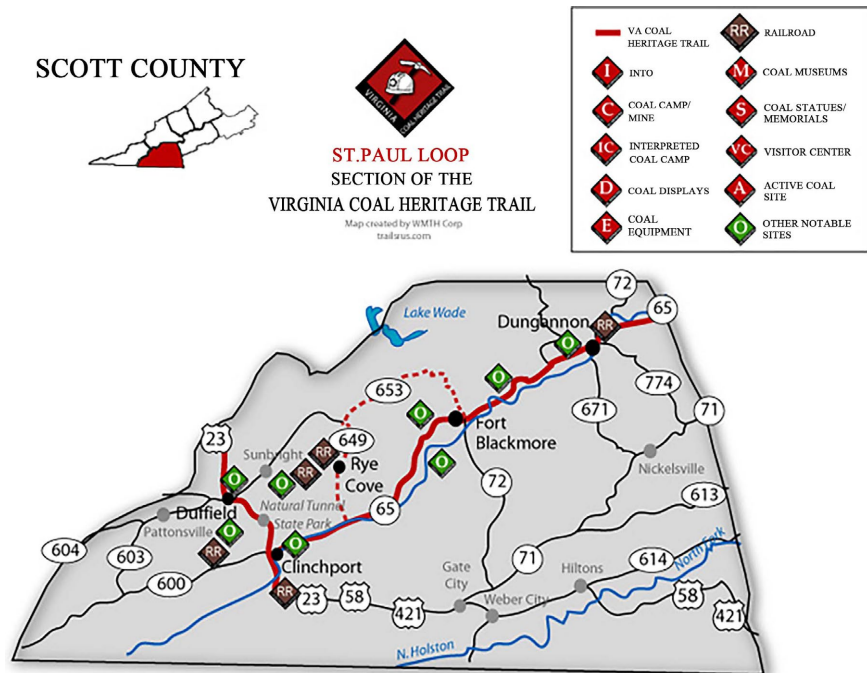


Figure 13. Potential climate change haven community locations.



Figure 14. AI generated image of a climate change haven community elementary school.

The elementary school shown in **Figure 14** above is appropriate for the Virginia Highlands and other regions having similar mountainous terrain. Zero carbon solar panel energy can supplement hydro-power generated electricity. Children will be transported to and from school using electric buses. Note the mountainous terrain surrounding the school.

Climate Change Haven Community Components for Lee, Scott and Washington County

- 1) Residential Housing
 - Homes & Apartments (Mixed-use, energy-efficient, disaster-resistant)
 - 10,000 single-family or condominium homes.
 - 10,000 apartment units.
- 2) Infrastructure & Utilities
 - Public Transit by electric buses.
 - Biodegradable Sewer, Waste Management.
- 3) Public Services
 - Schools (Elementary, Middle, High, Vocational).
 - Hospitals & Clinics.
 - Police, Fire, and Emergency Services.
 - AM radio station for emergency use.
- 4) Commercial & Retail
 - Shopping Centers, Grocery Stores, Restaurants.
 - Office & Technology-equipped Spaces.
- 5) Sustainability & Resilience Features.
 - Green Spaces, Parks, Reforestation
 - Climate Adaptation Measures (flood control, wildfire protection)
 - Smart City Technology & Carbon Neutral Design



Figure 15. AI generated image of a completed climate change haven community.

The image shown in **Figure 15** above depicts a completed Climate Change Haven Community. We estimate that this will take around 5 years to construct once

the necessary flood control measures, road installation and hydro-power generators are in place. It is imperative that funding sources be located and qualified construction firms be chosen as soon as possible.

Constructing Climate Change Haven Communities in Carroll, Bland and Patrick Counties

These three counties have lower-level mountains and milder climates than the six counties discussed previously. For this reason, modified Climate Change Haven Community costs are presented. The same AI generated buildings should be applicable to this setting; however the construction costs should be slightly lower and the operating costs slightly higher. This is due to their being built on less sloping terrain.

Carroll County

General Information

- Population (2023): 29,239
- Area: 478 square miles
- Towns:
 - Hillsville (County Seat).
 - Galax.

Employment & Economy

- Major Industries: Agriculture, forestry, small businesses, tourism
- Unemployment Rate (2024): 3.2%

Healthcare

- Healthcare Facilities: Small clinics and medical centers; the nearest full-service hospitals are in neighboring counties

Environmental & Hydropower Potential

- Current/Potential Flood Areas:
 - Areas along the New River and its tributaries
 - Low-lying farmland regions near creeks and streams
- Hydropower Potential: Limited due to lack of large rivers, but small-scale hydro may be possible in streams and creeks
- Location of Potential Hydropower Generators: New River tributaries, Laurel Fork, and smaller streams

Sustainability

- The county has ample space for Climate Change Haven Communities
- Location of Climate Change Communities: Near New River, agricultural zones, and higher-elevation areas away from flood risks

Demographics

- Ethnicities: Predominantly White (~95%)
- Could sustain 50,000+ newcomers with proper development

Development Costs

- Total Estimated Cost of Development: \$6 million
- Total Estimated Time Cost: 3 - 5 years
- Cost Estimation Breakdown for Homes & Infrastructure:

- Average Cost per Single-Family Home: \$150,000 - \$300,000
- Land Acquisition: \$10,000 - \$50,000 per acre (rural pricing)
- Construction Costs: \$120 - \$200 per square foot
- Utilities (Water, Sewer, Electricity): \$10,000 - \$30,000 per home
- Road Access & Driveways: \$5,000 - \$15,000 per home
- Permit & Legal Fees: \$5,000 - \$10,000
- ◆ Total Cost Per Home (1,800 sq. ft.): \$200,000 - \$350,000
- ◆ Estimated Cost for a 100-Home Development: \$20M - \$35M

Category	Estimated cost
Land acquisition	\$10,000 - \$50,000 per acre
Construction cost per home	\$120 - \$200 per sq. ft.
Utilities (water, sewer, electricity, gas, internet)	\$10,000 - \$30,000 per home
Road access & driveways	\$5,000 - \$15,000 per home
Permits & legal fees	\$5,000 - \$10,000 per home

Because Carroll County has a terrain of rolling hills, it will be possible to build more upscale single-family homes to accommodate new residents, instead of the condominium and apartment complexes suggested for the first 6 counties discussed earlier in this research [38].

Carroll County Dam Construction

- 1) The New River will require a small to medium sized earthen dam; to install a hydro power generator would be \$25 million.
- 2) Earthen Dam: \$691,000 to \$6.91 million.
- 3) Concrete Dam: \$3.46 million to \$13.82 million.
- 4) Rockfill Dam: \$2.07 million to \$10.37 million.

For a 1 MW to 5 MW hydropower system: Estimated cost: \$1 million to \$25 million, depending on the type of system, scale, and location.

Bland County

- 1) General Information
 - Population (2023): ~6,200
 - Area: 358 square miles
- 2) County Characteristics

One of Virginia's least populated counties.
- 3) Towns & Communities
 - Bland (County Seat)
 - Rocky Gap
 - Bastian
- 4) Health & Healthcare
 - Hospitals: No full-service hospitals, nearest in Bluefield, VA/WV and Wytheville
- 5) Environmental & Hydropower Potential

Hydropower Potential: Limited; small-scale hydro may be possible in streams

- Location of Potential Hydropower Generators: Tributaries of the New River
- 6) Climate Change Communities
- Near Jefferson National Forest and agricultural zones
- 7) Demographics & Politics
- Ethnicities: ~95% White,
- Politics: Heavily Republican
- 8) Population & Infrastructure Capacity
 - Because the county is rural and sparsely populated there is capacity for 20,000+ with proper development.
- How Many Hydropower Generators Can the County Hold?
 - Limited potential; a few small-scale hydro sites possible; Hydropower will need to be supplemented with solar and wind installations
- Location of Hydropower Generators:
 - Along Wolf Creek, Dry Fork, and New River tributaries
- 9) Climate Change & Development Costs
- Total Estimated Cost of Development: \$150M - \$500M depending on infrastructure needs
- Total Estimated Time Cost: 3-5 years for large-scale development
- Cost Estimation Breakdown for Homes & Infrastructure:
 - A. Housing Development Costs
 - Average Cost per Home: \$150K - \$300K
 - Cost for a 100-Home Development: \$20M - \$35M
 - B. Infrastructure Development Costs
 - Roads & Highways: \$1M - \$3M per mile
 - Utilities Expansion: \$5M - \$20M
 - Schools & Public Buildings: \$50M - \$100M
 - C. Special Projects: Hydropower & Climate Resilience
 - Small Hydropower Plant (~1 MW capacity): \$3M - \$7M
 - Solar/Wind Energy Projects: \$2M - \$10M
 - Flood Control Projects: \$5M - \$20M

Category	Estimated cost
Land acquisition	\$5,000 - \$30,000 per acre
Construction cost per home	\$120 - \$200 per sq. ft.
Utilities (water, sewer, electricity, gas, internet)	\$10,000 - \$25,000 per home
Road access & driveways	\$5,000 - \$15,000 per home
Permits & legal fees	\$3,000 - \$8,000 per home

- ◆ Total Estimated Cost Per Home (1,800 sq. ft.): \$180,000 - \$300,000
- ◆ Estimated Cost for a 50-Home Development: \$9M - \$15M
- ◆ Estimated Cost for a 100-Home Development: \$18M - \$30M
- Infrastructure Development Costs
 - A. Roads & Highways

Type	Cost estimate
Paved roads (Rural, 2-lane)	\$1M - \$3M per mile
Highway expansion (I-77, U.S. 52, Route 42)	\$5M - \$10M per mile
Bridges	\$5M - \$20M per bridge

◆ Estimated Cost for 10 Miles of New Roads: \$10M - \$30M

B. Utilities & Public Services

Utility type	Cost estimate
Water & sewer expansion	\$2M - \$5M per mile
Electric grid expansion	\$1M - \$3M per mile
Fiber internet expansion	\$500K - \$2M per mile

◆ Estimated Cost for Utility Expansion (Small Community): \$5M - \$20M

C. Schools & Public Buildings

Category	Cost estimate
New elementary or middle school	\$10M - \$30M
Public libraries & community centers	\$3M - \$10M

◆ Estimated Cost for Public Services Expansion: \$20M - \$50M

D. Hospitals & Healthcare Facilities

Bland County does not have a full-service hospital.

Facility type	Cost estimate
Small rural hospital	\$50M - \$100M
Clinic & urgent care centers	\$5M - \$15M

◆ Estimated Healthcare Expansion: \$10M - \$50M

Special Projects: Hydropower & Climate Resilience

A. Hydropower Development

Category	Cost estimate
Small hydropower plant (~1 MW capacity)	\$3M - \$7M
Solar & wind energy projects	\$2M - \$10M per site

◆ Estimated Cost for Renewable Energy Projects: \$10M - \$50M

B. Flood Control & Climate Resilience

Category	Cost estimate
Levees & flood barriers	\$5M - \$20M
Drainage system upgrades	\$2M - \$10M

◆ Estimated Cost for Flood Control & Climate Adaptation: \$10M - \$30M

The recommended placement of the flood control dam and hydro-power generators is in “Wolf Creek Watershed” which flows into the New River and Clinch

River basins and is shown in **Figure 16**. The lower black line is the proposed location for the flood control dam. The upper black line is where the hydro-power generator should be installed.

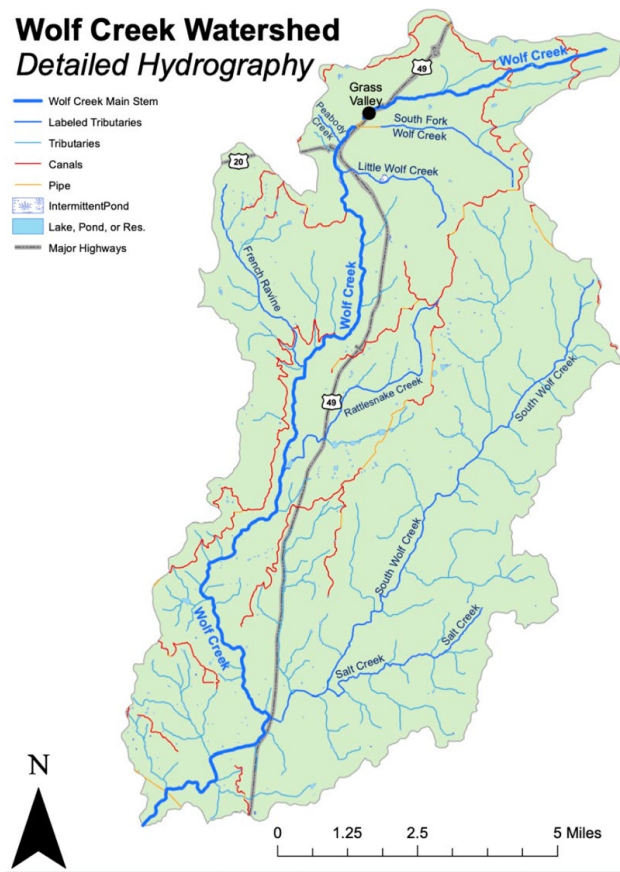


Figure 16. Map of wolf creek watershed.

- Earthen Dam: \$691,000 to \$6.91 million.
- Concrete Dam: \$3.46 million to \$13.82 million.
- Rockfill Dam: \$2.07 million to \$10.37 million.

For a 1 MW to 5 MW hydropower system:

- Estimated cost: \$1 million to \$25 million, depending on the type of system, scale, and location.

Patrick County

General Information

- Population (2023): ~17,500
- Area: 486 square miles

County Characteristics

- Primland Resort: A luxury mountain resort with golf, stargazing, and outdoor activities.
 - Rich Moonshine History: Ties to Virginia’s prohibition-era history
- Economy & Employment.

- Major Industries: Agriculture, forestry, tourism, manufacturing
- Towns & Communities
- Stuart (County Seat)
- Ararat
- Meadows of Dan
- Woolwine
- Critz
- Flood & Hydropower Potential
- Current/Potential Flood Areas:
 - Mayo River, Dan River, and Smith River flood zones.
 - Low-lying areas near tributaries may experience flash flooding.
- Hydropower Potential:
 - Small-scale hydro feasible along the Dan River and its tributaries.
- Location of Potential Hydropower Generators:
 - Tributaries of the Dan River and Mayo River.
- Estimated Costs for a 1,960-Acre-Foot Dam:
 - Earthen Dam: \$1.96 million to \$19.6 million.
 - Concrete Dam: \$9.8 million to \$39.2 million.
 - Rockfill Dam: \$5.88 million to \$29.4 million.
- Summary of Estimated Costs for Hydropower Generation at a 1,960-Acre-Foot Dam:
 - Conventional Hydropower (5 MW system): \$5 million to \$25 million.
 - Pumped Storage Hydropower (5 MW system): \$5 million to \$30 million.
 - Run-of-River Hydropower (1 MW system): \$1 million to \$3 million.
- Cost Range per kW:
 - Large Hydropower Projects: \$1,000 - \$2,500 per kW
 - Small Hydropower Projects: \$2,500 - \$5,000 per kW
 - Micro Hydropower Systems: \$4,000 - \$10,000 per kW
 - Typical cost range:
 - Small, local dams: \$1 - 3 million.
 - Medium-sized dams: \$10 - 100 million.
 - Large, complex dams: \$1 billion or more.
- Timeline:
 - Planning and permitting: 1 - 2 years.
 - Design: 1 - 2 years.
 - Construction: 2 - 5 years depending on the project size.
- Cost factors:
 - Dam size and type: Smaller, simple earthen dams will be significantly cheaper than large, concrete gravity dams.
 - Site conditions: Difficult terrain, rocky soil, and the need for extensive land acquisition can increase costs.
 - Environmental considerations: Mitigation measures to protect wildlife and water quality can add to the cost.

Because Patrick County already features an upscale resort, it may be desirable to promote it as a Climate Change Haven Community for wealthy climate migrants, both from the United States and other endangered regions of the world. Doing so would increase the tax base of the Virginia Highlands considerably and the additional funds could be used to construct Climate Change Haven Communities in less affluent counties of the Virginia Highlands [38].

7. Discussion and Conclusions

The goal of this research is not only to document the feasibility of building Climate Change Haven Communities in the Virginia Highlands and Appalachia in North America, but to provide initial cost and time estimates that can be used to construct Climate Change Haven Communities on a **global basis**. The AI images of eco-buildings developed for this project should be functional in similar mountainous, well-watered settings in countries such as Scotland, Canada, Scandinavia, Austria, Switzerland, Germany, France, Japan, Korea and areas of South America. The exterior design of the structures can easily be modified to be compatible with prevailing style preferences in these various countries.

Funding for the Climate Change Haven Communities in countries having more **centrally-directed economies** than the United States could permit the construction of these communities to begin immediately. Unfortunately, American citizens will need to rely on the anticipation of corporate profits by private contractors to stimulate actual construction of these communities. It is our hope that the estimates provided in this research will help ensure the quick entry of professional developers into this arena. There is very little time left for the construction process to begin and the transfer of vulnerable people to be completed, whether in the US or globally.

Resettling populations at-risk due to climate change **must become a global priority**. In the United States, and around the world, the environmental clock is ticking inexorably toward conditions that will not support human, animal, or even most plant life across large areas of the planet. Unless endangered people, their crops, and their businesses are moved to safer areas of the globe within the next five (ten at most) years, those of us who remain will be forced to live with the knowledge that we could have/should have helped others find safe havens before it was too late.

Future Research on Migrant Resettlement

However, the construction of Climate Change Haven Communities is one of the steps that will be required to resettling migrant populations in the United States and globally. In conjunction with building these communities, efforts must be made to **feed and employ** the migrants who come to live in them. It will do little good to transfer people to a new, climate-safe site, if they must still rely on foods shipped in distant regions by petroleum-powered vehicles.

Therefore, arable lands surrounding each new Climate Change Haven Commu-

nity must be prepared to grow sufficient crops and animals to support the food needs of the incoming population. Research must be conducted on what the most **appropriate crops and livestock** will be for a particular location. Skilled agriculturalists must also be sought and invited to move to the Climate Change Haven Community with the promise of low-cost acreage. In this regard, it is important to keep in mind that climate shifts occurring in the Climate Change Haven Community, itself, may make some current crops grown there no longer viable, while enabling the planting of new types of crops.

In the Virginia Highlands, for example, the warming temperatures and increased rainfall will be able to support crops now primarily grown in states farther south, for example, peaches, melons, strawberries, bananas and even citrus fruits are expected to be viable by 2030 [40]. Since these crops are now primarily grown in the Southern US states most susceptible to climate change, e.g., Florida, Mississippi, Georgia, a sound strategy would be to invite these endangered farmers to move to the planned Climate Change Haven Community sites in advance of the completion of construction. That way, food would be available when the new residents arrived. In Spain and France, for example, farmers are already being transferred from the drought-stricken regions in the southern sections of both countries to more temperate regions in the north [16]. Similarly, Scandinavia is already preparing to cultivate new crops as climate conditions change in the far north of the planet [41].

The future holds both promise and threat for all of us. Let us make the most progress we can during the next five years.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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