

Virginia Coalition of Housing and Economic Development Researchers

# **Addressing the Impact of Housing for Virginia's Economy**

A REPORT FOR VIRGINIA'S HOUSING POLICY ADVISORY COUNCIL  
NOVEMBER 2017

---

Appendix Report 9:

The Future of Housing in Virginia

Roy L. Pearson

K. Scott Swan

College of William and Mary

## Introduction

Scenario planning was used to imagine three possible futures in the Commonwealth and to gain insight into which future Virginia may be heading toward. In the first scenario, “surfing,” through decisive actions, Virginia’s economy is growing strongly and above the U.S. growth rate. In the second scenario, “struggling,” owing to deliberate and reactive adaptation, Virginia’s growth rate is slower than that of the United States. In the third scenario, “strolling,” because of a lack of innovative action, Virginia is pacing at the same economic growth rate as the United States. Depending on the actions the state takes, each future is possible.

### **Key Findings:** FUTURE OF HOUSING

- In a high-growth, highly competitive future, Virginia may need to add more than 700,000 housing units by 2030.
- State and local governments will increasingly need to partner with private enterprise and NGOs to carry out programs and functions formerly administered by the federal government.
- Proactive, decisive planning and policy that offsets federal devolution will make Virginia housing programs a competitive advantage.

Scenarios are coherent and credible stories describing how the future may unfold. They involve a multi-disciplinary and cross-impact approach, weaving together possible developments in demography, economy, government, environment, society, and technology (DEGEST). Scenarios are not forecasts, but the three here are plausible paths to 2030. These alternative paths allow one to imagine and then develop strategies for meeting the housing needs of alternative futures.

There are an infinite number of possible future scenarios. The selected scenarios must fit the intended audience, that is, Virginians whose focus is meeting the Commonwealth's future housing needs. Therefore, we emphasize possible situations in Virginia that drive interstate migration relative to the rest of the nation, impacting the demand for housing. We also avoid wildcards—high-impact events with low probabilities—which have effects beyond the normal range of responsibilities of Virginia housing providers, such as a national epidemic (where health services and emergency crews are the decision makers). Differences exist in the distribution of incomes, jobs, ages, social factors, and lifestyles in the three scenarios. The scenarios focus on the number of housing units needed, their uses, and their production. Therefore, our three hypothetical

scenarios are more quantitative than most and include projected demographic, employment, and housing numbers for 2030.

To construct the scenarios, we reviewed current and emerging trends and conducted a meta-analysis of futurology in the United States and abroad. Some key drivers of change that will shape Virginia housing are as follows:

- Slowing national economic growth
- Aging baby boomers (1946–1964) through 2030
- Advances and diffusion of digital technology
- Scale-up and commercialization of emerging technologies, such as synthetic biology, additive manufacturing (i.e., 3D printing), and the Internet of Things (IoT).
- Artificial intelligence (AI) and robotic technology that is increasingly substituting repetitive labor tasks, placing downward pressure on average wages and widening income disparities despite the creation of new types of jobs
- The increasingly untenable federal fiscal imbalance between revenues and spending that is increasing the federal debt total and as a percent of GDP. In 2017, gross federal debt was over \$20 trillion, or 104 percent of GDP. Under 2017 laws, the Congressional Budget Office (CBO) projects that debt will rise to nearly \$24 trillion in 2021, or 106 percent of forecast GDP, and continue rising as a percent of GDP unless major reductions are made in federal spending.
- Achieving an average of 3 percent real GDP growth for 2018–2021 by implementing expansionary fiscal policies in 2018 may stabilize the debt-to-GDP ratio temporarily. However, federal deficits are very likely to be approximately 3 percent of GDP in each of those years, with gross federal debt passing \$24 trillion in 2021. The fiscal imbalance will accelerate with GDP growth after 2021.

Several themes emerged from the interaction of these drivers of change:

- **Devolution of federal programs to the states will occur.** Unsustainable federal deficits and a rising debt-to-GDP ratio will force major changes in federal fiscal policy in the 2020s related to spending reductions over tax and fee increases (the CBO has evaluated 115 deficit reduction options: 43 proposed revenue enhancements and 72 spending reductions). Politically, mandated entitlement programs are difficult to change, especially rapidly, whereas discretionary programs covered in annual

appropriations bills are easier to curtail. Civilian discretionary programs currently account for 16 percent of federal spending, and 91 percent of federal spending on housing programs is discretionary.

- **Public-private sharing of responsibilities will predominate.** State and local governments will increasingly need to partner with private enterprise and NGOs to conduct programs and functions formerly administered by the federal government.
- **Virginia must understand the implications of changing net migration on housing.** At the state level, in- and outmigration are significantly affected by the difference between and levels of state and national real economic growth rates. These differences must be explicitly incorporated into projections and decision-making.
- **Early adopters have a long-term edge.** With an increasing rate of change, states with cutting-edge operations in emerging industries generally keep their edge even as others try to follow and the technologies become mainstream.
- **Housing must meet a wide range of needs.** Advances in digital technology will make the home a more intensely multifunctional place for living, socializing, entertaining, learning, and working. The benefits from integrating these advances into housing units will change the cost-benefit ratio of owning or renting for many households.
- **The gig economy is not a fad.** As the "gig" economy expands, a growing percent of the labor force will work virtually from a home office, many as independent contractors. Such work is well suited for the 65-and-over population still actively in the workforce (often by necessity) and can be a meaningful source of income.
- **The housing environment will be viewed differently.** Both physical and digital communities are becoming more valued, especially among maturing millennials.

We developed three scenarios incorporating these drivers and themes. The underlying numerical projections are shown in Table 1.

**Table 1**  
**2030 Virginia Levels, with Varying 2015-2030 Real Growth Rates (CAR)**

		<b>Surfing: Virginia Grows Exceptionally</b>	<b>Struggling: Virginia Adapts Too Deliberately</b>	<b>Strolling: New Norm Is 1.9% Real Growth</b>
	<b>2015 Actual</b>	<b>Va 3%, US 2.4%</b>	<b>Va 2.1%, US 2.5%</b>	<b>Va 1.9%, US 1.9%</b>
<b>Demographics</b>				
Total Population	8,382,993	10,019,221	9,231,476	9,496,559
20 to 64	5,101,257	5,868,642	5,340,803	5,371,768
65 and Over	1,188,393	1,798,399	1,759,639	1,776,177
<b>Labor Force</b>				
Total Labor Force	4,229,420	5,201,403	4,729,263	4,770,701
Resident Employment	4,042,769	4,972,541	4,511,717	4,536,937
Unemployed	186,651	228,862	217,546	233,764
Unemployment Rate	4.4%	4.4%	4.6%	4.9%
<b>Housing</b>				
Housing Units	3,468,829	4,174,675	3,924,198	3,928,287
Loss of 2015 stock		104,065	104,065	104,065
<b>Percent Changes from 2015 to 2030</b>				
		<b>Surfing: Virginia Grows Exceptionally</b>	<b>Struggling: Virginia Adapts Too Deliberately</b>	<b>Strolling: New Norm Is 1.9% Real Growth</b>
		<b>Va 3%, US 2.4%</b>	<b>Va 2.1%, US 2.5%</b>	<b>Va 1.9%, US 1.9%</b>
<b>Real Gross State Product</b>				
		55.8%	36.6%	32.6%
<b>Demographics</b>				
Total Population		19.5%	10.1%	13.3%
20 to 64		15.0%	4.7%	5.3%
65 & Over		51.3%	48.1%	49.5%
<b>Labor Force</b>				
Total Labor Force		23.0%	11.8%	12.8%
Resident Employment		23.0%	11.6%	12.2%
Unemployed		22.6%	16.6%	25.2%
<b>Housing</b>				
Change in Housing Units		20.3%	13.1%	13.2%
Construction, with replacement		23.3%	16.1%	16.2%

## “Surfing” Superior Growth Scenario

*Virginia is a growth and policy star among states*

It is the spring of 2031, and the Executive Director of the Council on Virginia's Future is reviewing the developments of the prior 15 years, 2015–2030. The U.S. economy has experienced moderately good real growth, growing at a compound annual rate (CAR) of 2.4% over the period considering the aging population and slower labor force growth. There was a surge in growth over the period 2018–2020 to 3.0% annually, but the economy then settled into the 1.9%–2.5% growth range. The year 2022 was a perfect storm for federal fiscal policy: the constraints on discretionary spending imposed by the Budget Control Act of 2011 expired in 2021 and spending in 2022 was nearly 19% higher than revenues, which pushed the federal deficit to \$950 billion, over 4% of GDP. Furthermore, the total federal debt was 106% of GDP and rising at an accelerating rate. Congress passed a range of budget policies to reduce the deficits over time, which included the devolution of several discretionary programs to state and local administration generally funded with federal block grants growing at less than the GDP growth rate. These policies forced states to either scale back the programs or fund a rising percent of the program costs, placing a premium on state economic growth rates that were higher than the national rate.

Virginia has consistently grown faster than the nation over these years, achieving a CAR of 3.0% and producing a Virginia Gross State Product (GSP) in 2030 that was 56% higher than in 2015. Virginia's growth was bolstered by playing a leading role in the expanding digital revolution and in biotechnology innovations, such as in synthetic biology. High-speed additive manufacturing using materials such as living cells, nylon, and high-temperature metals has made small-scale customized production cost-effective. It has spawned small- to medium-sized new manufacturing establishments with specialized products and job skills, reminiscent of cottage industries. Since 2025, Virginia also has had an active and growing industry cluster that offers a broad range of commercial space activities aided by NASA support. The state has also efficiently developed new state government policies and programs, often featuring public-private partnerships, to offset federal budget cutbacks.

At first glance, a 0.6% advantage in real growth over the nation may seem modest, but only a few states have consistently achieved such a margin. Over the 15-year period, this advantage produced an extra 13.1% in Virginia's Gross State Product. This difference was a boon to jobs and income for native Virginians that also generated larger net in-migration of people from other states as well as from other countries looking for jobs

and/or to enjoy the benefits. The population of Virginia was 8,382,993 in 2015, rising to an estimated 10,019,221 in 2030, which is an increase of 1,636,228 (i.e., 20%). The 20–64 age group grew an above-average 15% owing to in-migration of primary working-age adults, but the 65-and-over age group still had the largest percent gain (51%) stemming from population aging.

Virginia's above-average growth in 2015–2030 sustained resident employment of 4,972,541 in 2030, a gain of 929,772, or 23% over the 4,042,769 in 2015. The 2030 unemployment rate was 4.4%, leaving 228,862 unemployed out of a labor force of 5,201,403. The 2030 labor force participation rate was 63%, boosted by the Commonwealth's extensive community college and public–private initiatives in short-term continuing education certificate programs designed to match labor force skills to the specific jobs being created. These continuing-education programs employed many people aged 65 and over who passed licensing requirements to serve as tutors and mentors, increasing the over-65 labor force participation rate to more than 20%. The Commonwealth's focus on job-specific skills-enhancing continuing education has produced high annual growth in labor productivity, reducing the required labor force and sustaining worker pay raises. Since 2025, this continued learning has also facilitated the transition to widespread use of intelligent machines and interfaces in carrying out routine mental tasks such as Robotic Process Automation (RPA). In services and in manufacturing, humans have increasingly worked with artificially intelligent entities.

The substantial population growth was accompanied by a large increase in housing demand. In 2015, there were an estimated 3,468,829 housing units of all types in the state. By 2030, demand reached 4,174,675, an increase of 705,846, or 20%. With net scrap volume of approximately 104,000 residential units over the years 2015–2030, there were an estimated 810,000 units of total new residential construction, implying strong housing demand.

Following employment growth, population and housing growth occurred predominantly along two urban and suburban crescents by infilling along the concave crescent (along I-95 and from Northern Virginia and I-64 through Richmond to Hampton Roads) and the convex or reverse crescent (from western Northern Virginia straddling the Blue Ridge mountains: down Route 29 through Charlottesville and Lynchburg to Danville as well as down I-81 in the Shenandoah Valley through Harrisonburg to Roanoke and toward Bristol). The reverse crescent's industrial growth centered on new and innovative technology employed in collaboration with Virginia universities, medical schools, and community colleges.

In addition to increased quantity of housing demanded in Virginia, steady advances and broadening diffusion of digital technology have changed how the home is used for entertainment, learning, and work. The profusion of low-earth satellites ensures access to communication throughout the Commonwealth. Over the decade 2020–2030, the home increasingly became a low-cost center for digital entertainment. The declining cost, increased speed, enhanced visualization, and opportunity for personal immersion coupled with always-on social media have made the home virtual social gathering places. With the ability to always be online and widespread use of virtual reality (VR) and augmented reality (AR) devices, the home also has become a classroom. By 2023, the main education method for one third of courses was virtual, and the home functioned as a virtual office for one third of all workers. In 2031, that number is higher. Most at-home workers are full-time employees, but a growing percentage provide on-demand services as independent contractors as the “gig” economy has matured and generally regulated at the state level. Homes equipped as virtual offices and providing gig economy opportunities have been a prime source of additional income for the over 20% of the 65-and-over population actively in the labor force.

In sum, the home today serves a much broader range of functions for most people than in 2015, which inspired substantial changes in the design, content, and structural features of housing units for households of all ages in both new construction and in renovation of existing housing units. Changing social trends have also affected construction outside the home. People increasingly identify with and act as members of communities ranging in size from region to neighborhood. This trend builds on and reinforces an increased desire for sharing instead of owning, especially among millennials. The external environment of the home has become increasingly critical, with people seeking housing within a neighborhood that includes a range of amenities and avenues for interaction, usually managed by an active resident association.

On the supply side, advances and diffusion of digital technology developments such as AI and IoT coupled with changes in manufacturing techniques, especially the widespread use of additive manufacturing (i.e., 3D printing), have substantially altered housing construction. Many of the components required to meet changing demands for housing features and production techniques are constructed in a factory rather than onsite then transported, assembled, and installed on location. This modular approach to construction was adopted for about one third of Virginia housing by 2025 and is part of most housing construction today. This trend has increased productivity in housing construction, making housing relatively more affordable considering all features embedded in today's housing units. Inclusion of IoT biological sensors monitored by big data

networks has improved the healthiness of homes and made continuous external health monitoring and diagnosis possible.

Above-average growth and more-efficient construction have reduced the percent of households who require assistance for affordable housing, but the absolute number of needy households is larger than that in 2015. The Virginia government has assumed responsibility for providing housing assistance for employable households through programs such as housing choice vouchers, partly funded with federal block grants for housing assistance. The Commonwealth and local government agencies have implemented shared-ownership affordable housing programs, where the agency sells the household a share in the unit, usually at least 25% but less than 75% of the property, and the household pays rent on the remaining share. The affordable housing units are often built on public land acquired by the government agency, especially as localities work to rehabilitate substandard neighborhoods. Private non-profit organizations also fund affordable housing using various approaches such as shared equity mortgages (SEMs) and shared appreciation mortgages (SAMs). The Commonwealth and non-governmental organizations (NGOs) in partnership have expanded supportive housing facilities for the homeless and very-low-income individuals, especially those with physical or mental impairments, nearly eliminating homelessness.

## Surfing Persona: The Stay-at-Home Family

Liesl and Jake's home has incorporated substantial digital technology owing to lightning speed, large variety, low prices, availability, sensors, and connectivity. Their home is a business center, logistics hub, and immersive socialization, entertainment, and learning environment. Liesl had qualms about the amount of time they spent at home on electronic media but the whole family was enjoying something together. She also enjoyed the on-line yoga classes while Jake played his weekly virtual golf game with friends on the world's greatest courses.

Liesl is happy running a small design consulting business from the house and has clients in several states. Jake, unhappy with battling traffic, takes an autonomous transport to work and telecommutes at least three days a week for his database job. To drive more innovation and collaboration, the CEO of Jake's company limits the number of emails and texts sent to less than five per person daily, so Skype calls and personal visits to coworkers, partnering firms, and customers have become the norm. Liesl is thankful to avoid the drive and wait in lines by conducting most of the family business online such as banking, paying bills, and a wide variety

of services: ukulele lessons for their youngest child Hudson, personalized yoga lessons, and other educational classes for both Hudson and his older sister Eva when YouTube VR or Khan Academy are insufficient.

Jake loves the convenience, wide variety of options, and tailored meals that technology offers. Most recipes found on the Internet or in magazines using QR codes can easily be added to the following week's menu for preparation at home or via delivery ("bid" options are available to reduce costs). Food deliveries are linked to the menu, the refrigerator, and the pantry using sensors: products are scanned when delivered and most are automatically reordered if not returned within 24 hours (i.e., the system assumes they are consumed or spoiled). The family typically receives 3–4 packages from Amazon daily, with many of their daily necessities automatically delivered. Most packages are delivered by drone to a 10-foot-tall platform that opens on arrival. The drone releases the package to the enclosed conveyor belt that deposits its contents in an insulated box on the porch. More than 90% of their Christmas, birthday, and gift shopping is also conducted online. With the increased shuttering of physical stores, the time-consuming bother of driving to retail establishments pales alongside the preferable entertainment options at home, automatic reordering of consumables, and virtual shopping. Along with groceries and household items, all fast-food and many high-end restaurants and custom-order kitchens deliver. Many options exist for pre-prepared food and meal kits sized for a family with easy instructions for waste-free DIY food preparation, mainly provided by grocery stores. Drugstores, dry cleaners, and almost all remaining retailers also deliver.

Both Liesl and Jake conduct most of their business via virtual meetings and gatherings, which are accepted as a pragmatic alternative to personal interactions. Many people are more comfortable with this approach despite evidence that this does not facilitate as intimate or innovative relationships as in-person meetings do. Although effective multitasking has been proven a myth, it has become universal. Virtual meet-ups have become acceptable for first dates, socialization with friends and family, introduction to new acquaintances, elevation of hobbies, and education of new skills with fewer social risks. Liesl and Jake host an in-person dinner party once a month to maintain close friends and bond with new acquaintances.

Like most people, the family cut cable more than 10 years ago. Although ad-free cable channels exist, they prefer selecting from the thousands of on-demand, commercial-free programs, a couple dozen of which match their 25-point filter system (which can also substitute adult language with child-friendly harmless words and remove unwanted images). An 80-inch image is projected onto the living room wall and offers surround sound, including "rumble" speakers in the couch and chairs that allow you to feel the approaching raptor in Jurassic Universe (Part 4). Another room for the kids has a smaller, 40-inch TV for when they want to watch

or play something different (but they are usually happier just using their mobile phones to play games, watch movies, and text their friends, spending time with the family in the living room).

Although a difficult decision, Liesl and Jake joined the growing percentage of parents who, at least partially, homeschool their children. However, homeschooling has also changed. While still somewhat unusual, their eldest child Eva is a high-school senior that telecommutes three days per week to the public school.

Participating in the school remotely is more efficient, but in-person theater practice, group events, sports, and parties are more beneficial (however, being part of a virtual audience for many performances is very popular, including classes in a growing number of programs at most universities). Virtual tours are available with lecture overlays through most of the world's great museums, World Heritage Sites, and national parks. For science class, the family conducts experiments on the computer using virtual lab setups and physics simulators that are almost perfectly realistic but more sophisticated, safer, cleaner, repeatable, and much cheaper than those conducted in a real lab. Eva talks about how “gross” the virtual frog dissection was this year but still plans to become a physician.

## “Struggling” Lagging Growth and Policy Scenario

### *Virginia adapts too deliberately*

It is the spring of 2031, and the Executive Director of the Council on Virginia's Future is assessing the developments of the past 15 years, 2015–2030. The U.S. economy has experienced reasonably good real growth at a CAR of 2.5% over the 15 years considering population aging and slowing labor force growth. A surge in growth to 3.2% annually occurred over the period 2018–2020, but imbalances developed that led to a recession in 2025 and low growth in 2026. In the remaining years, real growth was in the 2.5%–2.9% range.

Virginia consistently grew slower than the national average over the period, reaching only 3% growth in 2017–2019 and 2.3% in many other years though fairing somewhat better than the nation in 2025 and 2026 with an average of 1% real growth. In 2030, the Virginia Gross State Product (GSP) was 36% higher than that in 2015, a CAR of 2.1% that underperformed the nation at a total cost to the Commonwealth of over 6% in 2030 GSP. Part of the reason for below-average growth was the defense buildup that started in 2018 and plateaued in the 2020s owing to budget constraints, and the state did not achieve a leading role in significant

emerging industries. In addition, the federal deficits and burgeoning national debt, exacerbated by political deadlock, forced the federal government to increasingly defer roles to the states after 2021.

States have had to assume responsibility for conducting an expanding range of programs formerly administered by the federal government owing to declining federal funding ratios. Virginia was somewhat slower than most states in reaching a consensus on strategies for addressing this devolution and implementing replacement programs, which was also affected by below-average growth in Virginia public revenues.

A 0.4% disadvantage in real growth may seem modest, but it generated a low net in-migration, from other states as well as from other countries. The Virginia population was 8,382,993 in 2015, and climbed to an estimated 9,231,476 in 2030, an increase of 848,483, or 10%. The 20-64 age group grew a below-average 4.7%, due to out-migration of primary working-age adults to get higher-paying jobs elsewhere, and the 65-and-over age group had by far the largest percent gain, 48%, stemming largely from the aging of the population. In 2015, the over-65 population was 14% of the total, rising to 19% in 2030. The change in percentage may not seem large at first glance, but in numbers the increase was 571,246 seniors, who have significantly different housing requirements than other groups do.

Virginia's below-average growth during 2015–2030 still supported resident employment of 4,511,717 in 2030, a gain of 468,949, 12% more than the 4,042,769 in 2015. The 2030 unemployment rate was 4.6%, leaving 217,546 unemployed of a labor force of 4,729,263. The 2030 labor force participation rate was 62%, boosted by the Commonwealth's public–private initiatives in continuing education certificate programs designed to match labor force skills to the specific jobs available. These continuing- education programs also enlisted many over-65 people to serve as tutors and mentors, helping raise the over-65 labor force participation rate. The Commonwealth's focus on job-specific skills-enhancing continuing education helped achieve moderate gains in productivity despite that private investment was below the national pace. Furthermore, much of the investment was in intelligent software and equipment to conduct repetitive tasks in professional and business services jobs to try to cut costs and remain competitive with out-of-state providers, limiting Virginia's growth in a range of middle-income jobs.

The Virginia population increase of 848,483 created the need for more housing. In 2015, there were an estimated 3,468,829 housing units of all types in the state. By 2030, demand reached 3,924,198, an increase of 455,369, or 13%. With net scrappage of around 104,000 residential units over the years 2015–2030, new

residential construction totaled an estimated 560,000 units, for an average demand of more than 37,000 new housing units annually.

In old and new housing, people want a broader range of features. The steady advances and broadening diffusion of digital technology have changed how the home is used for entertainment, learning, and work in Virginia and in the rest of the nation. The home increasingly became a low-cost center for digital entertainment over the decade 2020–2030. In addition, declining costs, increased speeds, enhanced visualization, and opportunity for personal immersion as well as always-on social media have made the home a virtual social gathering place. With ability to always be online and widespread use of VR and AR devices, virtual education has replaced physical schools as the main education method for one third of courses by the mid-2020s. Homes also became virtual offices for over one third of workers by the mid-2020s, and the number has risen since. Most at-home workers are full-time employees; however, a substantial percentage provide on-demand services as independent contractors as the gig economy has matured. For retirees, the digital divide is much narrower than it was in 2015, as those over 65 today were 50 or younger in 2015—the differences in digital immersion are related to cost of access rather than age.

The home in 2031 serves a much broader range of functions for most people than it did in 2015, leading to substantial changes in the design, content, and structural features of housing units for households of all types both in new construction and in renovation of existing housing units. Changing social trends have also affected construction outside of the home. People increasingly identify with and act as members of communities of a variety of sizes, from regions to neighborhoods. This trend builds on and reinforces an increased desire to share instead of own, especially among millennials. The external environment of the home has become increasingly important, with people seeking housing within a neighborhood that incorporates a range of amenities and safe places for interaction, often with an active resident association. However, with relatively slow growth and a declining percentage of middle-income jobs, there are large differences in neighborhoods based on average household incomes rather than age (as most neighborhoods have a core of seniors who chose, or were forced by lack of resources, to age in place).

On the supply side, housing construction has been substantially altered owing to advances and diffusion of digital technology developments such as artificial intelligence and the “internet of things” (IoT), coupled with changes in manufacturing techniques such as additive manufacturing (i.e., 3D printing). Rather than onsite, many changing demands for housing features and production techniques are best met by constructing components in a factory, where a range of electronics, security features, and customized designs can be

integrated in a controlled environment and then transported and assembled at the site. This modular approach to construction was adopted for about a third of housing construction nationwide by 2025. With Virginia's slower growth and only moderate growth in housing demand, the trend to modular construction has been less pronounced, constrained by the required investment in equipment and facilities as well as builder biases and state and local regulations. The modular housing trend has increased productivity in housing construction, making new housing relatively more affordable considering all the features embedded in housing units in 2031. However, the main emphasis in Virginia construction has been renovation and updating of the more than three million older houses and their neighborhood surroundings and amenities to match current housing desires and needs. The high number and increased percentage of seniors has led to declining average household size and demand for square footage, despite a somewhat increased number of multigenerational households.

Below-average economic growth and aging have increased the number of needy households beyond that in 2015. The Virginia government has assumed much of the responsibility of providing housing assistance for employable households through programs such as housing choice vouchers partly funded with federal block grants for housing assistance, but the revenue growth rate of the state has not matched those of other states. The Commonwealth and local government agencies have adopted innovations such as shared ownership affordable housing programs, where the agency sells the household a share in the unit of typically at least 25% but less than 75% of the property, and the household pays rent on the remaining share. Affordable housing units are often built on public land acquired by the government agency, especially as localities work to rehabilitate substandard neighborhoods. Private non-profit organizations funding affordable housing have adopted a variety of approaches, including SEMs and SAMs. The Commonwealth and NGOs have partnered to expand the supportive housing facilities for the homeless and very-low-income individuals, especially those with physical or mental impairments. However, a substantial gap remains in meeting the housing and assistance needs of low- to middle-income seniors.

The lower rate of new residential construction, which is also below the national rate, has constricted the filter-down process of providing affordable housing.

Furthermore, below-average investment available for renovation of older units to include today's digital and energy technologies has reduced the percentage of affordable housing with similar home and neighborhood attributes that other houses have. A rising percent of low-income households, especially among the 19% of the population 65 and over, feel more socially isolated.

## Struggling Persona: The Local Government Official

Eddie has a difficult job as a local housing administrator. Nearly 50% of the county's households cannot afford a house, 30% are "cost-burdened" (i.e., paying more than 30% of their income for housing), and over 20% cannot afford rent (with many paying more than 50% of their income for housing while making difficult tradeoffs against other necessities). Many households rely on community groups and church organizations for help with food and clothing. Eddie's biggest concern is finding a difficult balance among government funding requirements, businesses' requirements, and the needs of the citizens for well-paying jobs and safe, affordable housing. Adequate funding to help seniors and low-income citizens is lacking, but some grants and low-interest loans are available. Home-repair emergency funds are meager, and his organization focuses on using funds to weatherproof houses and rehabilitate existing neighborhoods.

Eddie's talks with his constituents usually touch on complex quality-of-life issues. Residents prefer low taxes, bucolic settings, well-maintained traffic-free roads, picturesque houses, and plenty of open land. The outcomes of cost-burdened citizens are sprawling, low-density development leading to a larger number of commuters. These housing struggles and their outcomes have consequently reduced overall quality of life.

Workers are less likely to keep low-paying jobs, reducing supply and creating difficulties for growing companies in the region, causing some to relocate. One recent conversation Eddie had with his friend Jen highlighted another issue. Jen, a very healthy 71-year-old widow, is struggling to find a job but is not willing to leave Virginia, her family, and friends. She recently visited a friend out of state and noticed the better job opportunities, improved roads, well-maintained parks, and environmental care. The visit made her wishful that such improvements could be available to her and others in Virginia. This is Eddie's wish as well, but reaching these goals is difficult.

Eddie believes that conditions may improve if there is a critical mass of entrepreneurial activity.

Unfortunately, the economic hardships and lack of funds in Virginia to help startups have created a brain drain, particularly outside the area that includes Northern Virginia to Virginia Beach that were once considered part of the high-growth crescent. Eddie's growing concern is that many other states are superior in filling the needs of these embryonic companies. He is particularly frustrated that innovations in manufacturing techniques, such as 3D printing (which improve quality and lower costs in system-built housing) are available but most Virginia locales have not substantially changed housing zoning, permitting, and approval requirements. Regulations could be improved to allow more construction experimentation;

however, many innovations have not been embraced in the state despite being prevalent elsewhere. He wonders whether the local traditional approach that uses local materials and local labor should be replaced by not-regulated-here approaches that do not contribute to local taxes. Despite realizing this short-term view, the speed of these alternative construction techniques helps him rationalize concerns that these innovative approaches may also raise shoddy quality and safety issues.

Voters also exhibit bias against factory-built homes despite being higher quality and similar-looking to other homes in the neighborhood. Eddie believes that increasing housing density will be helpful, because it improves the tax base and increases community space. “Granny pods” or tiny homes built to circumvent zoning rules have also become widespread, but these raise concerns about acceptable living conditions and the appropriate amount of space a household requires.

Amazon has started to offer these tiny homes with two-day delivery for standard models, and whether they can be regulated is unclear (owing to Amazon’s clout). This type of house is positioned as a value option for those who desire energy efficiency, low resource use, less financial burden, and a non-materialistic lifestyle but still want to enjoy high-quality features and built-in entertainment options. Eddie believes that the attributes of these houses are appropriate, but it is not clear how the local government can control for the negatives and embrace the positives of this growing experiment.

## “Strolling” Lockstep Scenario

### *Growth is volatile around a norm of 1.9 percent*

It is the spring of 2031, and the Executive Director of the Council on Virginia’s Future is reviewing the developments of the previous 15 years, 2015–2030. The U.S. economy went through two cyclical swings of unsustainable real growth with accelerating inflation followed by periods of tighter monetary policy and federal budget constraints that brought growth to near zero, first in 2018–2022 and again in 2023–2027. The net result was a growth CAR of only 1.9% for real GDP and 2.6% for the GDP price index over the 15 years. The 1.9% CAR consisted of a combined labor and capital contribution to growth of .9% per year and multifactor productivity growth of 1% per year (better than the .8% per year for 2000–2015 but still modest). Real government spending grew less than GDP at a 1.0% growth CAR. Real private investment spending fluctuated widely, averaging a moderate 2.4% CAR, primarily in equipment (particularly labor-saving AI

systems and robotics). Businesses and the government have found it increasingly cost-effective to replace repetitive business, financial, and analytical tasks with AI systems in jobs that were paying \$40,000–\$90,000 per year in 2015, reducing the number of low- to moderate-income households. The economic volatility and low real GDP growth reduced VC funding available for startups in emerging industries such as synthetic biology, delaying time-to-market of many technologies.

In 2030, the U.S. population was up only 10.9% from 2015 owing to lower foreign immigration, but the over-65 population increased 54% as the population aged. The labor force was 11.6% higher, at 175 million, but the unemployment rate was 4.9%. Income disparity increased owing to below-average growth, an increasing number of contract and gig-economy workers, and increasing use of AI systems and robotics in services and manufacturing.

Virginia's Gross State Product (GSP) was less volatile than the nation's but tracked the U.S. performance at a growth CAR of 1.9% for the period 2015–2030. Virginia's GSP was therefore 33% higher in 2030 than in 2015, clearly a real gain. However, in the mid-2020s federal deficits passed 5% GDP and total Federal debt topped 110% of GDP, forcing Congress to mandate that the states assume responsibility for conducting an expanding range of programs formerly administered by the federal government and funded with steadily declining block grants. Virginia faced its own budget constraints, leading to increased reliance on public–private partnerships and NGOs to provide health, housing, and welfare services.

The Virginia population was 8,382,993 in 2015 and climbed to an estimated 9,496,559 in 2030, an increase of 1,113,566, or 13.3%. The 20–64 age group grew only 5.3% owing to a lack of in-migration of primary working-age adults, and the 65-and-over age group had the largest percent gain of 50.8%, stemming largely from Virginians aging in place. In 2015, the over-65 population was 14.2% of the total, rising to 18.7% in 2030. The change in percentage may not seem large at first glance, but in numbers the increase was 587,784 more seniors, with a significant impact on the kinds of housing units needed.

Virginia's 1.9% growth CAR in 2015–2030 supported resident employment of 4,536,937 in 2030, a gain of 446,461, or 11% more than the 4,042,769 in 2015. The 2030 unemployment rate was 4.9%, leaving 233,764 unemployed out of a labor force of 4,770,701. The 2030 labor force participation rate was 61.6%, aided by the Commonwealth's public–private initiatives in continuing education certificate programs designed to match labor force skills to the specific available jobs. The cyclical swings in the economy have forced more people to

be unemployed for substantial periods and to search for new jobs, but the availability of and access to certification programs with mentors and coaches has dampened oscillations in the unemployment rate.

The Virginia population increase of 1,113,566 people has created the need for more housing. In 2015, there were an estimated 3,468,829 housing units of all types in the state. By 2030, demand reached 3,928,287 units, an increase of 459,458, or 13.2%. With net scrappage of approximately 104,000 residential units over the years 2015–2030, total new residential construction was an estimated 564,000 units for an average of over 37,500 new housing units demanded annually. The number and growth rate of new housing units was thus less than that during 2000–2015, particularly owing to an increase in multi-generational households (especially low-income ones), holding the average household size to 2.42 despite the substantial increase in number and percentage of seniors.

Housing uses have changed significantly. Steady advances and broadening diffusion of digital technology have increased the use of the home for entertainment, learning, and work. Over the decade 2020–2030, the home increasingly became a low-cost center for digital entertainment. The declining cost, increased speed, enhanced visualization, opportunity for personal immersion, and access to always-on social media have also made the home a virtual social gathering place. With the ability to always be online across the Commonwealth and widespread use of VR and AR devices, the home has become a virtual classroom, and virtual education became a demonstration technique in many courses in the late 2020s.

By 2025, the home became a virtual office for about 40 percent of workers. Many at-home workers are full-time employees, but a substantial percentage provide on-demand services as independent contractors as the gig economy has matured. For retirees, the digital divide is much narrower than it was in 2015, as those over 65 today were 50 or younger in 2015—the differences in digital immersion are related to cost of access and equipment rather than age.

Slow economic growth and fluctuating unemployment rates have made asset accumulation harder for most households, generating a stronger desire for security through property ownership and security features in the home and neighborhood.

The home in 2031 serves a broader range of functions for most people than it did back in 2015, which has fostered substantial changes in the design, content, and structural features of housing units for households of all ages in both new construction and the renovation of existing housing units. Changing social trends have also affected construction outside of the home. People increasingly identify with and act as members of

communities that vary in size from region down to neighborhood. They seek housing within a neighborhood with safe places for interaction and nearby services, typically with an active resident association. However, with relatively slow growth and a declining percent of middle-income jobs, there are large differences in neighborhoods based mainly on average household incomes rather than age (as most neighborhoods have a core of seniors who chose, or were forced by lack of resources, to age in place). NIMBYism (i.e., “not in my backyard”) still tends to segregate neighborhoods with households’ incomes at or below 50% of the area median income (AMI).

On the supply side, advances and diffusion of digital technology developments such as AI and IoT coupled with changes in manufacturing techniques (especially 3D printing) have substantially altered housing construction. Many of the changing demands for housing features and production techniques are best met by constructing components in a factory, where a range of electronics, security features, and energy efficiencies can be integrated in a controlled environment and then transported and assembled onsite. This system-built approach to construction was adopted for about a quarter of housing construction nationwide by 2027, mainly because of savings in time and money. The system-built housing trend is increasing productivity in housing construction, making new housing relatively more affordable than in 2015 considering the features embedded in today’s housing units despite that finished lot costs have increased substantially in urban areas. However, the main emphasis in Virginia construction has been renovation and updating of the over three million older housing units and their neighborhood surroundings to match current housing desires and needs.

Below-average economic growth, a lower percentage of middle-income jobs, and aging have increased the number of needy households beyond that in 2015. The Virginia government has assumed much of the responsibility of providing housing assistance for employable households through programs such as housing choice vouchers that are partly funded with federal block grants for housing assistance, but state revenue growth has not matched the need. The Commonwealth and local government agencies have adopted innovations such as shared-ownership affordable housing programs, where the agency sells the household a share in the unit that is usually at least 25% but less than 75% of the house, and the household pays rent on the remaining share. Affordable housing units often are built on public land acquired by the government agency, especially as localities work to rehabilitate substandard neighborhoods. Private non-profit organizations funding affordable housing have adopted a variety of approaches, including SEMs and SAMs. The Commonwealth and NGOs have partnered to expand supportive housing facilities for the homeless and

very-low-income individuals, especially those with physical or mental impairments. However, a substantial gap remains in meeting the housing and assistance needs of low- to middle-income seniors.

The lower amount of new residential construction here has constricted the filter-down process of providing affordable housing. Furthermore, below-average investment available for renovation of older units to include digital and energy technologies has reduced the percentage of affordable housing that share the home and neighborhood attributes most other households enjoy. A rising percent of low-income households, especially among the nearly 19% of the population 65 and over, feels more socially isolated.

## **Strolling Persona: The Sharing Family**

Ruth, recently divorced, has moved from Chicago into Virginia. The economy is slow nationwide, but this transition is motivated by her desire to be near her parents, Bill and Naomi. Ruth has found a job after recently completing a program as a certified nurse assistant, making \$22,500 but feeling unsettled and knowing that her pay is insufficient to support her small family. She likes being home again. She and her two children have concerns staying with her parents, but need a place until they receive a small settlement and can find a home. She wants to focus on her family, create stability, secure simple necessities such as traditional values and honest food. She wants to share good times with some old friends.

Ruth is having a difficult time finding affordable housing. A new career, personal changes, and moving have raised flags with most lenders. Government programs have created better housing options in the last decade, but her personal circumstances, restrictive city and county zoning, the shifting emphasis from federal to state and local control, and tight governmental budgets have limited her options. Several dealers of manufactured housing said that they can help her obtain a home but cannot find allowable land. Modular housing would be easier but more expensive, whereas traditional “stick-built” houses are at their lowest stock in two decades; consequently, prices for even small homes have risen dramatically. Increased responsibility has been placed on local governments for assistance, but Ruth has not been able to find any programs yet that can offer more than advice, a little training, and a kind heart.

She has also considered building a small addition to her parents' home, which may be appropriate given the increasing age of her parents and their foreseeable health concerns as well as her need for help with the children. Bill and Naomi like that their daughter and grandkids may live with them, but Ruth is less agreeable to a long-term living arrangement with her parents. Although she would like help with the children, her

parents still work part-time to pay the bills and spend some time on other social interactions. Ruth is happy that there is a range of financing options available for such an addition; furthermore, her parents have qualified for a low-interest loan to accomplish some much-needed repairs. Staying with them would also provide Ruth with a level of security, familiarity, and access to a few luxuries that her children would enjoy compared to leaving the county to find a cheaper apartment and commute to her job, which would solve the housing issue but increase transportation costs and time away from her kids, which she would rather not do.

Her parents live in a very friendly neighborhood comprising mainly renovated houses that were built 90 years prior. Although the school system is not top-notch, it is sufficient for her family's needs. However, the home has high-speed internet that offers a large range of entertainment options and learning possibilities.

Ruth is comforted that her parents have invested in security features and a monitoring service – at least this offers some peace that is much needed at this time in life. Bill and Naomi were considering additional services to help them with aging concerns (e.g., virtual interaction with service and health providers as well as meal preparation and delivery). Those ideas have been put on hold since Ruth can fulfill those needs while living in the house. She hopes her parents can rearrange their work schedules to watch the kids after school and help them with homework. The economic situation makes her worry but she is happy to have a place to stay and a promising career with future potential. Ruth commits to her mother that they will stay put for at least the next year.