PART IV: BUILDING COMMUNITY RESILIENCE

Resilience In Community: Major Sectors

This video is a continuation of video 20, in which we talked about how to make the essential support systems of society—food, water, energy, and money systems—more resilient. In this video we'll explore the manufacturing, transportation, and buildings sectors; we'll also discuss land use and public policy, again with an eye to resilience-building.

Manufacturing, transportation, and buildings use energy to provide goods and services. In video 20 we looked at energy supply—switching from fossil fuels to renewable energy. Here we are talking mostly about ways we use energy. Transforming manufacturing, transportation, and buildings will entail finding ways to use less energy for these purposes, ways to use it that suit renewable energy sources, and ways to provide for human needs while using fewer material resources and producing less pollution.

Okay, in ***manufacturing***, our goals should be to localize production, reduce the scale of production where possible, to design and build products in a way that facilitates repair and reuse, and to use recycled materials where possible.

Localization of manufacturing will create local jobs and increase the diversity of local skills; it will also increase the overall redundancy of manufacturing capacity, which is bad from the standpoint of economic efficiency but good from the standpoint of increasing community resilience. The same could be said for inventories of raw materials and finished goods: localization will imply increased local inventories, which increases community resilience in the face of supply chain disruptions. Some economic commentators say that local manufacturing will become easier and more cost effective as a result of the new technology of 3-D printing combined with

open-source software, as a sort of new "commons". The DIY or "Do-It-Yourself" movement and the maker movement are popular local-manufacturing trends that may help spur more decentralized production.

Farmer-physicist Marcin Jakubowski and his colleagues have an especially interesting vision of local manufacturing. They've spent the past few years inventing the Global Village Construction Set—open-source blueprints that enable fabrication (from locally available recycled materials) of 50 key industrial machines including tractor, wind turbine, bioplastic extruder, and 3-D printer. Jakubowski's goal is to provide every community with access to the basic technology needed to maintain a comfortable, sustainable, locally self-sufficient existence. So far, only a few of the modular machines have been fully designed and prototyped, but Jakubowski's project has attracted both investors and eager interns.

Our current **transportation** system is almost entirely fueled with depleting, climate changing petroleum. Building resilience in this sector therefore has a great deal to do with reducing oil consumption in moving both people and stuff.

It's helpful to study a chart showing the relative energy intensity of the various transport modes. As you can see, aviation and personal automobiles are inherently the most energy intensive; rail and buses are at the other end of the spectrum. So, in building transport resilience, our overarching goals should be, first, to reduce the need for transporting people as much as possible by designing our cities better (for mixed-use neighborhoods and for walking and bicycling); second, to reduce the need for transporting stuff by localizing manufacturing and food systems; and third, to prioritize transport by walking, bicycling, buses, and rail over transport by airplanes, cars, and trucks. And we should electrify trains and buses as much as possible, so we can use renewable energy to power them.

Electric cars can be a helpful substitute for gasoline-powered cars, but they're certainly not a full solution to the problem of making our transport systems resilient and sustainable. We transport far more stuff than people, so we'll need to give special attention to shipping and trucking. Ships can be made more efficient with sails, and small local-delivery trucks could run on batteries, compressed air, or fuel cells. But again our best option will be to reduce the need for transport of goods by economic localization and the elimination of consumerism.

No modern industrial city has yet moved entirely to a post-petroleum transportation system. In the United States, New York City, San Francisco, and Boston have the best public transit systems, and also encourage walking and bicycling; but they remain extremely dependent on petroleum-powered cars and trucks. Seoul, South Korea has perhaps the best transit system in the world, so it's worth thinking about whether some of the things that city has done could be replicated elsewhere. Transit passes are cheap; they work in all transit modes including subways, buses, and taxis; and they can even be used as debit cards at local stores. The subway cars are super-clean and spacious. In addition, through its Eco-Mileage program, the Seoul metropolitan government provides energy consultants to help citizens find the best ways to save energy. Participants in the program earn points according to the amount of energy they save, and those points can be redeemed as public transit vouchers.

Buildings use energy for heating space and water, for lighting, for air conditioning, and to power appliances and gadgets. In addition, buildings themselves represent embodied energy: that is, it takes a tremendous amount of energy to make steel, concrete, and other building materials, to move them to the site, and to put them together into the final form of the building. Resilience and sustainability translate to reducing both operational and embodied energy.

We can reduce operational energy by designing structures to benefit from sunlight for heat and light. With the addition of super-insulation and heat sinks, it is possible to reduce heating and air conditioning energy needs by over 90 percent. In Germany, the passive-house movement has built over 20,000 structures to extremely high energy-efficiency standards, so we know it can be done. But to get it done quickly and on a broad scale will require changes in local and national builds standards. We can reduce the embodied energy in buildings by using more local, natural materials, and by designing structures to last centuries rather than just a couple of decades. We can reduce the amount of materials needed to construct buildings, and the energy needed to heat and cool them, by designing smaller homes and office buildings and favoring multifamily housing over single-family housing.

Clearly, it would be impractical if not impossible to replace all of our nation's building stock with better-designed structures over a short span of time; however, energy retrofits could save enormous sums for homeowners and companies. Just installing better insulation and replacing a natural gas heating system and existing air conditioner with an air-source or ground-source electric heat pump could save the average household hundreds of dollars a year in energy bills.

Seattle's Bullitt Center is a six-story, 52,000-square-foot commercial structure built by the Bullitt Foundation, and it shows just what is possible for resilient and sustainable buildings. On a net basis, it uses zero energy and water. Its features include composting toilets, toxic-free materials, a greywater treatment system, and a rainwater catchment system. Its energy conservation measures cut the building's energy usage to about a third that of a typical office building of similar size, and the energy it does use is supplied by a PV solar array on the roof, where you'll also find a water purification system. The Bullitt building has no parking spaces—only bike racks. It cost $355 per square foot to construct, which is about twice the Seattle average, but the increased

investment will yield ongoing savings to all its users. And those savings will be spread out over a long time: the Bullitt building was designed to have a 250-year lifespan, unlike a conventional commercial structure, which is typically designed for a 40-year life.

The subject of **land use** covers a lot of territory, if you'll pardon the figure of speech. It touches on every aspect of local government concern, involving decisions on air quality, water quality, biodiversity, transportation options, economic vitality, and quality of life. Every community has lots of competing uses for land, which is needed for residential, civic, industrial, open space, and agricultural purposes.

When we assess the resilience of a system—like a community—we need to look at general characteristics that build resilience, like redundancy and information feedback; but we also need to look at the urgent vulnerabilities specific to *that* system. In American communities, one of our biggest vulnerabilities has to do with transportation. In most cases, there is literally no easy way to get from Point A to Point B other than driving a privately owned car—and that's because of nearly 100 years of decisions we've made about land use. Our communities sprawl over many square miles, with houses far away from stores and schools, usually all at densities so low that public transit doesn't make sense. If your car breaks down, or you can't afford to own one—or gas prices suddenly triple—*tough!* You have no other option. That is not a resilient community.

So, in the United States, planning land use in a way that builds the resilience of a community often starts with transportation. Neighborhoods can be re-zoned to increase density and allow stores and other commercial uses to mix with housing along corridor streets—so-called "mixed-use" areas that were common before World War II and that characterize some of America's most desirable places to live. Such neighborhoods are easy to walk and bicycle in, and when they make up an entire community they are easily serviced by

public transit. It's also necessary to provide targeted investments in walking, bicycling infrastructure, public transit, and public space.

Communities can use land use planning to deal with many challenges other than transportation. Economic development can be encouraged by changing zoning and building regulations that hurt small businesses. Economic inequality can be fought with land use actions that discourage gentrification and support affordable housing development.

But perhaps the most obvious application of land use planning in community resilience building is in coastal communities' response to climate change and rising sea levels. The state of Louisiana offers us at once a very bad, and also a better, example. Changes in the Mississippi Delta that were designed to increase flood protection and enhance oil and gas production have instead destroyed wetlands and put entire communities and ecosystems at risk. Since 1932 the Mississippi River delta in south Louisiana has lost twenty-three hundred square miles of land, and it's still losing the equivalent of a football field every hour to erosion, subsidence, and sea level rise. The two million people who live and work in the coastal region face a looming crisis that could lead to what's been called "the largest forced migration for environmental reasons in the history of the country." That's in the words of a recent report. In the last few years, Louisiana planners have developed a *Best Practices Manual for Development in Coastal Louisiana,* which recommends 109 different projects costing a total of $50 billion to restore marshes and take other actions to stop the gradual loss of land in the delta. It would take an estimated $50 billion more to reverse the trend and reclaim land that has already been swept away.

Finally, sound ***public policy*** is essential to community resilience efforts—with the recognition that imposing policies from above without adequate understanding of, or support for, those policies from community members will lead to political failure.

In most communities, there are already organizations promoting local food, public transportation, renewable energy, and other issues related to sustainability and resilience. Policy makers should work not only with these organizations but also with the public in general to educate and involve community members in these kinds of projects, to further long-term goals. Specific policies may, for example, may have to do with food production in suburban and nearby rural areas; with establishment of a local recycling and compost-making service; with strengthening building codes for energy efficiency; with support for local renewable energy; with making city operations (which means municipal vehicles and buildings) more sustainable; and with disaster planning that takes into account likely regional impacts from climate change.

As an example, the City of Vancouver, British Columbia has initiated a "Greenest City" action plan that includes a goal of 100 percent renewable energy before 2050, a climate change adaptation plan, a green city operations plan, a neighborhood energy strategy, and a public education program to promote energy awareness.

One relevant aspect of public policy receives too little attention—that's local laws and ordinances, that can help or hinder resilience building efforts. Sometimes existing laws having to do with building design, energy, and food systems just make no sense. The Sustainable Economies Law Center works to highlight and change those kinds of laws. A few years ago it collaborated with Project Better Block to organize an event in Dallas that featured newly created on-street parking, sidewalk dining, sidewalk flowers, parking-protected bike lanes, and pop-up shops, intentionally breaking several local ordinances in the process. The organizers put the text of those ordinances on display, and invited the city council along to see how foolish those ordinances were.

Not even the greenest of our cities has found a way to fully accomplish all of the needed shifts we have identified in the manufacturing, transportation, buildings, land use, and public policy sectors.

Building community resilience will be an iterative process, requiring time and sustained effort. The important thing is that we start now and bring the entire community along with us on the journey.