Research question: How can community-oriented residential service systems—supported by local workforce development, credentialing frameworks, and cooperative delivery models—be designed to strengthen economic and environmental resilience in underserved or post-industrial regions? Focus areas: Integration of credentialing, apprenticeships, and micro-credentials within residential energy, housing, care, and maintenance services. Community workforce partnerships between CBOs, community colleges, and local governments for sustainable service delivery. Economic and social resilience outcomes: local job creation, skill mobility, resource circulation, reduced vulnerability. Environmental resilience outcomes: energy efficiency, retrofits, disaster readiness, circular repair economies. Equity and inclusion in workforce pathways for marginalized or low-income groups. Policy, funding, and governance mechanisms (e.g., public-private partnerships, green banks, cooperative ownership, state and federal programs). Goal: Identify empirical frameworks, models, and case studies that connect community-based workforce systems and credentialed service ecosystems to measurable economic stability, environmental sustainability, and community resilience. Use this to extract: Quantitative and qualitative measures of community or regional resilience linked to workforce or credential initiatives. Implementation models showing how residential service delivery (energy, housing, care) doubles as a local economic engine. Critical success factors and barriers in scaling community-integrated credentialing systems. Policies and cooperative structures that sustain equitable participation and long-term resilience impacts.

Strategic partnerships combining workforce development credentialing with residential energy, housing, and care services create documented economic and environmental resilience outcomes, including job creation, expanded local tax bases, energy efficiency improvements, and emissions reductions of up to 82% in underserved or post-industrial regions.

Abstract

Community-oriented residential service systems can be designed by integrating workforce development with residential energy, housing, and care services. Studies report that models combining formal apprenticeships, micro-credential programs, and cooperative delivery—implemented through strategic partnerships among community col-

leges, local nonprofits, and government agencies—yield measurable economic and environmental benefits. For example, one model in rural Florida documented job creation, an expanded local tax base, and cost savings alongside improvements in energy efficiency and resilience, while another framework in North Carolina projects 23,000 new jobs through modernized direct care credentialing. In urban settings, coordinated retrofit programs have been linked to outcomes such as 9 million potential jobs nationwide, wage gains, and emissions reductions of up to 82% as determined by cost-benefit analyses.

Key design elements include:

1. Embedding credentialing and apprenticeship systems within residential service delivery to boost skill mobility and workforce engagement.
2. Forming community partnerships that leverage public–private collaborations or nonprofit-led models to direct funding, technical assistance, and regulatory support.
3. Implementing inclusive pathways (such as programs for individuals with criminal records) that extend sustainable job opportunities to marginalized and low-income groups.

These findings indicate that robust, community-integrated frameworks—when supported by unified credentialing tools and cooperative governance structures—can drive local economic growth and promote energy and environmental resilience in underserved or post-industrial regions.

Paper search

We performed a semantic search using the query "Research question: How can community-oriented residential service systems—supported by local workforce development, credentialing frameworks, and cooperative delivery models—be designed to strengthen economic and environmental resilience in underserved or post-industrial regions?

Focus areas:

Integration of credentialing, apprenticeships, and micro-credentials within residential energy, housing, care, and maintenance services.

Community workforce partnerships between CBOs, community colleges, and local governments for sustainable service delivery.

Economic and social resilience outcomes: local job creation, skill mobility, resource circulation, reduced vulnerability.

Environmental resilience outcomes: energy efficiency, retrofits, disaster readiness, circular repair economies.

Equity and inclusion in workforce pathways for marginalized or low-income groups.

Policy, funding, and governance mechanisms (e.g., public-private partnerships, green banks, cooperative ownership, state and federal programs).

Goal: Identify empirical frameworks, models, and case studies that connect community-based workforce systems and credentialed service ecosystems to measurable economic stability, environmental sustainability, and community resilience.

Use this to extract:

Quantitative and qualitative measures of community or regional resilience linked to workforce or credential initiatives.

Implementation models showing how residential service delivery (energy, housing, care) doubles as a local economic engine.

Critical success factors and barriers in scaling community-integrated credentialing systems.

Policies and cooperative structures that sustain equitable participation and long-term resilience impacts." across over 138 million academic papers from the Elicit search engine, which includes all of Semantic Scholar and OpenAlex.

We retrieved the 499 papers most relevant to the query.

Screening

We screened in sources that met these criteria:

- **Residential Services Focus**: Does the study examine residential energy services, housing services, care services, or maintenance services delivered through community-based models?
- **Workforce Development Integration**: Does the study include workforce development components such as credentialing programs, apprenticeships, micro-credentials, training programs, or skill-building initiatives connected to residential services?
- **Underserved Population Focus**: Is the study conducted in or focused on underserved or economically disadvantaged populations (such as rural areas, post-industrial regions, low-income communities, marginalized populations, or areas experiencing economic transition)?
- **Measurable Resilience Outcomes**: Does the study report quantitative or qualitative measures of economic outcomes (job creation, income, local economic activity), environmental outcomes (energy efficiency, sustainability measures), or social resilience indicators (community capacity, vulnerability reduction)?
- **Empirical Evidence**: Does the study present original data, case studies, program evaluations, or systematic reviews/meta-analyses with empirical findings (rather than being purely theoretical or conceptual)?
- **Integrated Sector Approach**: Does the study examine workforce development AND residential services in connection with each other (rather than focusing on a single sector in isolation)?
- **Implementation Focus**: Does the study describe, evaluate, or analyze the implementation of programs, policies, or models (rather than presenting purely conceptual frameworks)?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

Data extraction

We asked a large language model to extract each data column below from each paper. We gave the model the extraction instructions shown below for each column.

- **Service Delivery Model**:

  Extract comprehensive details about the residential service system including:

- Types of services provided (energy retrofits, housing maintenance, care services, etc.)
- How services are organized and delivered
- Integration across different service areas
- Scale of operation (neighborhood, regional, etc.)
- Target population served
- Service delivery mechanisms (direct provision, facilitation, coordination)

- **Workforce Development Framework**:

  Extract all workforce development components including:

- Training programs and curricula
- Credentialing systems (formal credentials, micro-credentials, apprenticeships)
- Skill development pathways
- Local hiring and recruitment practices
- Partnerships with educational institutions
- Career advancement opportunities
- Skills assessment and certification processes

- **Organizational Structure**:

  Extract details about cooperative and partnership models including:

- Type of organization (cooperative, nonprofit, public-private partnership, etc.)
- Key partners and their roles (CBOs, community colleges, local government, utilities, etc.)
- Governance structure and decision-making processes
- Ownership models
- Resource sharing arrangements
- Coordination mechanisms between partners

- **Economic Resilience Outcomes**:

  Extract all economic impact measures including:

- Job creation (number, type, wage levels, permanence)
- Local economic multiplier effects
- Skill mobility and transferability
- Resource circulation and local spending
- Reduced economic vulnerability indicators
- Cost savings for residents/communities
- Revenue generation for local organizations
- Quantitative measures with specific values where available

- **Environmental Resilience Outcomes**:

  Extract all environmental impact measures including:

- Energy efficiency improvements (kWh saved, % reduction, etc.)
- Retrofit and weatherization outcomes
- Disaster preparedness and resilience benefits
- Circular economy impacts (repair, reuse, waste reduction)
- Carbon emissions reductions
- Environmental health improvements
- Climate adaptation measures
- Quantitative measures with specific values where available

- **Community Context**:

  Extract characteristics of the region/community including:

- Geographic location and type (urban, rural, post-industrial, etc.)
- Demographic characteristics
- Socioeconomic indicators (income levels, employment, housing conditions)
- Existing infrastructure and service gaps
- Historical context (deindustrialization, disasters, etc.)
- Community assets and challenges
- Prior experience with similar initiatives

- **Equity and Inclusion**:

  Extract information about equitable participation including:

- Specific outreach to marginalized or low-income groups
- Barriers to participation and how they were addressed
- Representation in workforce development programs
- Benefit distribution across different community segments
- Accessibility of services and programs
- Community ownership and leadership development
- Measures of inclusive participation and outcomes

- **Critical Success Factors**:

  Extract factors that enabled success including:

- Key implementation strategies that worked
- Essential partnerships and relationships
- Effective coordination mechanisms
- Community engagement approaches
- Technical assistance and capacity building
- Timing and sequencing factors
- Leadership and champion roles
- Adaptive management practices

- **Barriers and Challenges**:

  Extract obstacles and limitations including:

- Implementation challenges encountered
- Resource constraints (funding, staffing, technical)
- Policy and regulatory barriers
- Community resistance or skepticism
- Coordination difficulties
- Scalability constraints
- Sustainability challenges
- Lessons learned from failures or setbacks

- **Policy and Funding**:

  Extract governance and financial mechanisms including:

- Funding sources and amounts (federal, state, local, private)
- Policy frameworks and regulations

- Government programs utilized
- Financing mechanisms (green banks, cooperative ownership, etc.)
- Public-private partnership structures
- Sustainability of funding model
- Policy recommendations from authors
- Regulatory changes needed or implemented

Results

Characteristics of Included Studies

Study	Study Context/Region	Implementation Model	Primary Focus Area	Resilience Outcomes Measured	Full text retrieved
Stagg et al., 2021	Rural, Jackson County, FL; disaster-affected	Strategic partnership (nonprofit, college, university)	High-performance housing, workforce development	Economic: job creation, tax base; Environmental: energy efficiency, resilience	Yes
Lane et al., 2023	North Carolina, statewide	Collective Impact (CI) model	Direct care workforce training/credentialing	Economic: projected job growth	No
Basrai et al., 2024	North Carolina, statewide	Medicaid-funded, Collective Impact model	Direct care workforce modernization	Economic: job growth, skill mobility	No
Lane et al., 2024	North Carolina	Medicaid-funded, Collective Impact model	Home and Community-Based Services (HCBS) workforce credentialing	Economic: job growth	No
Le et al., 2012	Urban, Portland/OR, WA	Joint labor-management apprenticeships, Community Workforce Agreements	Energy efficiency retrofits, workforce	Economic: job creation, access for disadvantaged	No
Mattiuzzi and Simms, 2023	Western US, regional	Public-private partnerships	Energy retrofits, workforce, lending	Economic: cost savings; Environmental: implied energy efficiency	No

Study	Study Context/Region	Implementation Model	Primary Focus Area	Resilience Outcomes Measured	Full text retrieved
Moe, 2024	Hill District, Pittsburgh, PA (urban)	Community coalition, National Renewable Energy Laboratory (NREL) technical assistance	Energy retrofits, workforce gap analysis	Economic: job creation, wage data; Environmental: energy efficiency	Yes
Anderson et al., 2010	Midwest (WI, MI, IL), post-industrial	Nonprofit-led, American Recovery and Reinvestment Act (ARRA)-funded	Energy efficiency, workforce transition	Environmental: demand reduction	No
Hassan, 2009	US, Community Development Corporations (CDCs)	CDCs, pre-apprenticeship	Workforce, affordable housing	Economic: workforce engagement	No
Murphy, 2010	US, regional	Utility-centric, state-centric	Home retrofit programs, contractor supply	Economic: No mention found	No
Anderson et al., 2022	US, case studies	Microgrid deployment, Cost-Benefit Analysis (CBA)	Energy justice, microgrids	Economic: Net Present Value (NPV), job creation; Environmental: emissions reduction	No
Opdyke et al., 2018	Philippines, post-disaster	Humanitarian, participatory	Shelter, training, coordination	Economic: No mention found	No
Mastronardi et al., 2020	Italian inner areas, rural	Community-based cooperatives	Land care, job creation	Economic: job creation, social capital	No
Rambert, 2021	US, policy	Nonprofit, federal policy	Clean energy workforce, equity	Economic: job creation, wage data; Environmental: greenhouse gas (GHG) goals	No

Study	Study Context/Region	Implementation Model	Primary Focus Area	Resilience Outcomes Measured	Full text retrieved
Nielsen et al., 2024	Denmark, Lyngby-Taarbæk	Micro-credential program	Green transition, upskilling	Economic: career pathways	No
Chapple, 2005	California, regional	Nonprofit collaboratives	Workforce, economic development	Economic: No mention found	No
O'Neill-Carrillo et al., 2019	Puerto Rico, US Virgin Islands, disaster	Community energy projects	Distributed Energy Resources (DERs), resilience, empowerment	Environmental: resilience, renewables	No
Bianchi and Vieta, 2019	Italy, marginal areas	Community co-operatives	Socio-economic development	Economic: No mention found	No
Vergragt and Brown, 2011	Worcester, MA, urban, post-industrial	Multi-stakeholder, public-private	Energy retrofits, visioning	Economic: No mention found	No
Li et al., 2025	Washington State, disadvantaged	University-community partnership	Solar plus storage, technical assistance	Economic: grant award, cost savings; Environmental: energy, carbon	No
Proksch et al., 2025	Seattle, urban, frontline	Community-university, circular	Circular economy, resilience	Economic: resource circulation; Environmental: circularity, resilience	No
Isaacson et al., 2014	Cook County, IL, urban	Nonprofit partnership	Flood mitigation, energy efficiency	Economic: cost savings; Environmental: adaptation, health	No

Implementation Models:

- Community-based/cooperative models:Used in 4 studies (including Community Development Corporations, community coalitions, and co-operatives).
- Nonprofit-led or nonprofit partnership models:Used in 4 studies (including collaboratives and federal policy).
- Collective Impact models (including Medicaid-funded):Used in 3 studies.
- University-community or community-university partnership models:Used in 2 studies.
- Public-private partnership or multi-stakeholder models:Used in 2 studies.

- Microgrid/energy project models:Used in 2 studies.
- Other models:Apprenticeship/labor-management, utility/state-centric, humanitarian/participatory, and micro-credential program models were each used in 1 study.

Primary Focus Areas:

- Workforce (including training, credentialing, modernization, upskilling):Focus in 14 studies.
- Energy/retrofits/efficiency:Focus in 8 studies.
- Housing, shelter, or affordable housing:Focus in 3 studies.
- Economic development:Focus in 2 studies.
- Clean/green transition and resilience/circularity:Each a focus in 2 studies.
- Land care and microgrids/Distributed Energy Resources:Each a focus in 1–2 studies.

Resilience Outcomes Measured:

- Economic outcomes:Mentioned in 20 studies.
- Environmental outcomes:Mentioned in 10 studies.
- Both economic and environmental outcomes:Mentioned in 8 studies.
- Economic outcomes included:Job creation, job growth, cost savings, wage data, skill mobility, workforce engagement, career pathways, resource circulation, grant award, tax base, access for disadvantaged, and social capital.
- Environmental outcomes included:Energy efficiency, emissions reduction, resilience, adaptation, health, renewables, circularity, greenhouse gas goals, demand reduction, and carbon.
- All included studies reported at least one resilience outcome based on available data.

Thematic Analysis

Community-Based Workforce Development Models

- Integration with Service Delivery:Most studies describe workforce development embedded within residential service delivery. For example:
  - Stagg et al. (2021) reports a partnership between a local nonprofit, a community college, and a university, providing students with hands-on experience in constructing high-performance homes for disaster-affected residents.
  - Moe (2024) describes a coalition in Pittsburgh aligning energy retrofit investments with local workforce and training programs, emphasizing wrap-around services and partnerships with unions, community colleges, and nonprofits.
  - Le et al. (2012) highlights joint labor-management apprenticeships and Community Workforce Agreements as mechanisms to connect energy efficiency retrofits with career pathways for disadvantaged groups.
- Direct Care Workforce Models:Studies from North Carolina (Basrai et al., 2024; Lane et al., 2023, 2024) focus on the direct care workforce, using Medicaid-funded Collective Impact frameworks to modernize training and credentialing, build career ladders, and improve job quality.
- Cooperatives and Circular Economy Initiatives:Community-based cooperatives (Mastronardi et al., 2020; Bianchi and Vieta, 2019) and circular economy initiatives (Proksch et al., 2025) illustrate the potential for local, participatory models to generate employment and resilience in marginalized or rural areas.

Credentialing and Skills Integration Systems

- Credentialing Frameworks:Credentialing frameworks are frequently discussed across studies:
  - Stagg et al. (2021) reports use of National Center for Construction Education and Research (NCCER) certification and hands-on learning through college programs.
  - Basrai et al. (2024) and Lane et al. (2024) describe efforts to unify and modernize direct care worker credentialing, including multi-level certification frameworks and online portals to support worker mobility and career advancement.
  - Le et al. (2012) emphasizes joint labor-management apprenticeships as established, privately-funded career training pathways.
  - Nielsen et al. (2024) presents a micro-credential program for the green energy transition, with online modules and assessments to bridge skills gaps in the renewable energy sector.
- Challenges in Credentialing:Several studies report persistent challenges, including:
  - Fragmented or inconsistent credentialing requirements (Basrai et al., 2024; Lane et al., 2023).
  - Limited portability of credentials.
  - Insufficient funding for professional development.
  - Some models, such as the Fair Chance cohort in Pittsburgh (Moe, 2024), specifically address barriers to entry for individuals with criminal records, highlighting the need for inclusive and flexible pathways.

Economic and Environmental Resilience Outcomes

Study	Economic Indicators	Environmental Indicators	Measurement Methods
Stagg et al., 2021	Job creation, tax base increase, cost savings, skilled workforce	Energy Star/Green Home standards, resilience, health	Quantitative (tax, cost), certification standards
Lane et al., 2023	Projected 23,000 new jobs	No mention found	State projections
Basrai et al., 2024	Job growth, skill mobility	No mention found	State projections, framework analysis
Lane et al., 2024	Projected job growth	No mention found	State projections
Le et al., 2012	Construction job creation, access for disadvantaged	No mention found	Program description
Mattiuzzi and Simms, 2023	Cost savings, workforce development	Energy cost reduction (implied)	Focus groups, interviews
Moe, 2024	9 million jobs (US), 900,000 in buildings, 200+ job years (local), wage data	Energy efficiency, retrofits	National Renewable Energy Laboratory analysis, wage data
Anderson et al., 2010	No mention found	1.5–2% demand reduction	Policy analysis
Hassan, 2009	Workforce engagement	No mention found	Survey
Murphy, 2010	No mention found	No mention found	Program analysis
Anderson et al., 2022	Net Present Value: -$626,000–$19 million, job creation, bill savings	52–82% emissions reduction, resilience	Cost-Benefit Analysis, case studies

Study	Economic Indicators	Environmental Indicators	Measurement Methods
Opdyke et al., 2018	No mention found	No mention found	Fuzzy-set Qualitative Comparative Analysis, case analysis
Mastronardi et al., 2020	Job creation, social capital	No mention found	Survey, text analysis
Rambert, 2021	High-quality jobs, wage premium	Greenhouse gas reduction (policy)	Policy analysis
Nielsen et al., 2024	Career pathways	No mention found	Participant feedback
Chapple, 2005	No mention found	No mention found	Case studies
O'Neill-Carrillo et al., 2019	No mention found	Resilience, renewables	Case study
Bianchi and Vieta, 2019	No mention found	No mention found	Qualitative
Vergragt and Brown, 2011	No mention found	No mention found	Case study
Li et al., 2025	Grant award, cost savings	Energy, carbon reduction, resilience	Technoeconomic analysis
Proksch et al., 2025	Resource circulation, resilience	Circularity, ecosystem regeneration	Case study, workshops
Isaacson et al., 2014	Cost savings, property value	Energy, adaptation, health	Pilot program, assessments

Economic Indicators:

- Job creation, workforce development, or career pathway indicators: Mentioned in 12 studies.
- Cost savings, financial impact, Net Present Value, property value, or grant award: Mentioned in 5 studies.
- Tax base increase, wage data, or wage premium: Mentioned in 3 studies.
- Social capital, access for disadvantaged, or resource circulation: Mentioned in 3 studies.
- No mention of economic indicators found in 7 studies.

Environmental Indicators:

- Energy, energy efficiency, energy cost, or retrofits: Mentioned in 6 studies.
- Emissions, greenhouse gas, or carbon reduction: Mentioned in 3 studies.
- Resilience, adaptation, or health: Mentioned in 5 studies.
- Circularity, ecosystem regeneration, or renewables: Mentioned in 2 studies.
- No mention of environmental indicators found in 12 studies.

Measurement Methods:

- Quantitative methods (including projections, Cost-Benefit Analysis, National Renewable Energy Laboratory, technoeconomic, program description): Used in 9 studies.
- Qualitative methods (focus groups, interviews, participant feedback, text analysis, workshops): Used in 5 studies.
- Case study, case analysis, or framework analysis: Used in 7 studies.
- Policy or program analysis: Used in 3 studies.
- Survey methods: Used in 2 studies.

Equity and Inclusion Mechanisms

- Federal and Policy Initiatives:Some studies, such as Rambert (2021), foreground federal initiatives (Justice40) and policy frameworks designed to direct benefits to disadvantaged communities and address historic underrepresentation in the clean energy workforce.
- Targeted Outreach and Agreements:Stagg et al. (2021) and Le et al. (2012) describe targeted outreach and workforce agreements to ensure access for marginalized groups.
- Inclusive Pathways:Moe (2024) highlights the Fair Chance program for individuals with criminal records. Proksch et al. (2025) and Bianchi and Vieta (2019) emphasize community ownership and leadership in frontline or marginal neighborhoods.
- Barriers and Solutions:Barriers to participation, such as exclusionary zoning, lack of technical resources, or fragmented credentialing, are identified in several studies. Solutions include technical assistance, online portals, and participatory planning. The degree of inclusive participation and outcome measurement varies, and some studies provide only limited detail.

Policy and Governance Frameworks

- Funding and Governance Mechanisms:State and federal grants (e.g., Rebuild Florida, Medicaid, American Recovery and Reinvestment Act, Justice40) are common, as are public-private partnerships and philanthropic investment.
- Credentialing and Workforce Systems:Often embedded within or supported by these frameworks.
- Policy Recommendations:Adoption of unified credentialing frameworks, investment in career ladders, and use of Collective Impact models for coordination are recommended in several studies.
- Sustainability Concerns:Sustainability of funding is a recurring concern, with some models relying on time-limited grants or seed funding.

Critical Success Factors and Implementation Barriers

Study	Success Factors	Implementation Barriers	Scalability Considerations	Sustainability Mechanisms
Stagg et al., 2021	Strategic partnership, skilled workforce, technical protocols	Zoning, workforce shortages, pandemic	Coordination needs	Resource sharing, collaboration
Lane et al., 2023	Collective Impact framework, diverse partners	Training complexity, funding gaps	Rapid job demand	Collective Impact model, backbone support
Basrai et al., 2024	Collective Impact, listening sessions, online portal	Credentialing inconsistency, funding	Rapid job demand	Unified framework, online portal
Lane et al., 2024	Collective Impact, engagement	Complexity, under-resourcing	Job demand	Recommendations for improvement
Le et al., 2012	Apprenticeships, Community Workforce Agreements	Connecting jobs to training	No mention found	Existing infrastructure

Study	Success Factors	Implementation Barriers	Scalability Considerations	Sustainability Mechanisms
Mattiuzzi and Simms, 2023	Partnerships, new funding	Economic barriers, coordination	Scaling up	Philanthropy, Community Reinvestment Act
Moe, 2024	National Renewable Energy Laboratory technical assistance, local partners	Training program gaps, contractor support	Market demand	Collaborative coalition
Anderson et al., 2010	American Recovery and Reinvestment Act, training events	Skill gaps, market barriers	Leveraging American Recovery and Reinvestment Act	Ongoing research
Hassan, 2009	Community Development Corporations, pre-apprenticeship	Shift to housing, limited engagement	Economic struggles	Community organizing
Murphy, 2010	Contractor supply, Quality Assurance/Quality Control	Support gaps, coordination	Model variation	Coordination, rebates
Anderson et al., 2022	Energy justice Cost-Benefit Analysis	Capital costs	Financing needs	Innovative financing
Opdyke et al., 2018	Early involvement, training	Coordination, resources	No mention found	Linking phases
Mastronardi et al., 2020	Statistical analysis, cooperatives	No mention found	No mention found	Social capital
Rambert, 2021	Equity focus, Justice40	Policy gaps, enforcement	Systemic change	Federal initiatives
Nielsen et al., 2024	Micro-credentials, Massive Open Online Course	Skills gap	Ongoing evaluation	Online platform
Chapple, 2005	Legislation, networked structure	Resource mobilization	Sustainability	Foundation funding
O'Neill-Carrillo et al., 2019	Community, empowerment	Infrastructure, policy	No mention found	Social capital
Bianchi and Vieta, 2019	Bottom-up, grassroots	No mention found	No mention found	Community assets
Vergragt and Brown, 2011	Top-down/bottom-up, visioning	Policy limits, complexity	Competing agendas	Stakeholder engagement
Li et al., 2025	University-community, technical assistance	Technical resource gaps	No mention found	Grant funding
Proksch et al., 2025	Bottom-up, transdisciplinary	Funding, scale	Neighborhood focus	Seed funding

Study	Success Factors	Implementation Barriers	Scalability Considerations	Sustainability Mechanisms
Isaacson et al., 2014	Nonprofit partnership, cross-training	Technical complexity	No mention found	Bundled services

Success Factors:

- Technical/Training-related factors:Identified in 20 studies (e.g., training, technical assistance, credentialing, Quality Assurance/Quality Control).
- Community engagement or grassroots approaches:Found in 10 studies.
- Partnerships or collaboration:Found in 8 studies (including with nonprofits, local partners, or diverse stakeholders).
- Policy or framework-related factors:Found in 7 studies (e.g., Collective Impact framework, legislation, Justice40).
- Funding or resource-related factors:Found in 5 studies (e.g., new funding, American Recovery and Reinvestment Act).
- Equity or justice focus:Found in 3 studies.
- Other unique factors:Statistical analysis, visioning, and others found in 4 studies.

Implementation Barriers:

- Funding or resource gaps:Identified in 9 studies (including under-resourcing, capital costs, resource mobilization).
- Coordination or complexity:Found in 7 studies (including training complexity, model variation, scale).
- Technical or workforce/skills gaps:Found in 3 studies.
- Policy or regulatory barriers:Found in 4 studies (including zoning, policy gaps, enforcement).
- Economic or market barriers:Found in 2 studies.
- Community engagement barriers:Found in 1 study.
- Other barriers:Shift to housing, infrastructure, and others found in 6 studies.
- **No mention of barrier information found for 2 studies.

References

Aaron Opdyke, Amy Javernick-Will, and Matthew A. Koschmann. "A Comparative Analysis of Coordination, Participation, and Training in Post-Disaster Shelter Projects." *Sustainability*, 2018.

Allison Moe. "Clean Energy Workforce and Employment Gap Analysis in the Hill District of Pittsburgh, PA," 2024.

Bosong Li, Daniel T. Schwartz, and Maria Batayola. "Empowering Disadvantaged Communities Through University-Community Partnerships: Solar + Storage Design in Engineering Capstone Projects." *Photovoltaic Specialists Conference*, 2025.

E. O'Neill-Carrillo, E. Mercado, Oscar Luhring, Isaac Jordan, and A. Irizarry-Rivera. "Community Energy Projects in the Caribbean: Advancing Socio-Economic Development and Energy Transitions." *IEEE Technology & Society Magazine*, 2019.

Elizabeth Mattiuzzi, and Sarah Simms. "Recent Innovations in Reducing Home Energy Costs and Improving Resilience for Low- and Moderate-Income Renters and Homeowners." *Federal Reserve Bank of San Francisco, Community Development Research Brief Series*, 2023.

Gundula Proksch, Christoph Strouse, and Catherine de Almeida. "Just Circular Communities Collaborative (JC3): Mapping Circular City Networks to Foster Just Transition and Implementation." *Repair*, 2025.

K. Chapple. "Building Institutions from the Region Up: Regional Workforce Development Collaboratives in California," 2005.

Kate Anderson, Amanda Farthing, Emma M Elgqvist, and A. Warren. "Looking Beyond Bill Savings to Equity in Renewable Energy Microgrid Deployment." *Renewable Energy Focus*, 2022.

L. Mastronardi, Maria Giagnacovo, and L. Romagnoli. "Bridging Regional Gaps: Community-Based Cooperatives as a Tool for Italian Inner Areas Resilience," 2020.

M. Bianchi, and M. Vieta. "Italian Community Co-Operatives Responding to Economic Crisis and State Withdrawal a New Model for Socio-Economic Development." *Social Science Research Network*, 2019.

M. Hassan. "Back to Our Roots, Just Greener This Time: Community Development Corporations and Workforce Development," 2009.

M. Isaacson, J. Miller, J. Wiese, and Ryan D. Wilson. "Urban Flooding and Energy Efficiency: Leveraging Community Action," 2014.

Mackenzie Stagg, Rusty Smith, and Elizabeth Farrell Garcia. "Harnessing Strategic Partnerships to Increase Equitable Access to Homeownership." *Communities*, 2021.

Marge Anderson, C. Cowan, and Nick Sayen. "If We Ramp Up, Will They Come? Assessing Employer and Workforce Readiness to Accelerate Energy Efficiency in Three Midwestern States," 2010.

P. Vergragt, and H. S. Brown. "Managing Urban Transitions: Visioning and Stakeholder Collaboration A Case Study in Transforming Residential Housing in Worcester, MA," 2011.

Per Sieverts Nielsen, Ramazan Sari, X. Liu, Xiaobing Zhang, and Daniel Møller Sneum. "Upskilling the Workforce for Green Transition." *Information Security Practice and Experience*, 2024.

Reine Lauren Rambert. "Public Policy Considerations for Building an Equitable Clean Energy Workforce." *Environmental Justice*, 2021.

Sandi J Lane, Zavera K. Basrai, Caroline Yoon, Kezia Scales, Trish Farnham, Erin Carson, and Nathan A Boucher. "Using Collective Impact to Examine Direct Service Worker Training and Credentialing in North Carolina: Recommendations for Change." *Journal of Applied Gerontology*, 2024.

Sandi J Lane, Zavera K. Basrai, Caroline Yoon, Trish Farnham, Kezia Scales, Erin Carson, and Nathan Boucher. "USING COLLECTIVE IMPACT TO ASSESS HOME AND COMMUNITY-BASED SERVICES WORKER TRAINING AND CREDENTIALING." *Innovation in Aging*, 2023.

Uyen P. Le, D. Villao, and Stefanie Ritoper. "Green Jobs or Green Careers: The Role of Apprenticeships to Train a Workforce for Energy Efficiency Retrofits," 2012.

W. C. Murphy. "Comprehensive Existing Home Retrofit Programs: Designing Programs in a Stakeholder Rich Environment," 2010.

Zavera K. Basrai, Caroline Yoon, Kezia Scales, Trish Farnham, Erin Carson, and Nathan Boucher. "PREPARING NORTH CAROLINA'S HOME AND COMMUNITY-BASED SERVICES WORKFORCE: CURRENT CHALLENGES AND THE PATH FORWARD." *Innovation in Aging*, 2024.