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Policy Brief

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Climate resilient development in Italy: Practical steps and lessons from regions and sectors

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The policy problem

The concept of **Climate-Resilient Development (CRD)**, proposed by the Intergovernmental Panel on Climate Change, highlights the urgency of effectively integrating climate change adaptation and mitigation while ensuring socio-economic development. Achieving this requires coordinated action at the local, national, and international levels. As part of the implementation of European directives (Green Deal, Climate Law, Adaptation Strategy), Italy has taken important steps by adopting the National Climate Change Adaptation Plan (2023) and the Integrated National Plan for Energy and Climate (2024). However, the enabling conditions that make the transition toward CRD possible remain poorly documented, both nationally and internationally, representing a critical gap for research and policy implementation.

This study examines the practical efforts taken in the transition toward CRD in Italy.

Advancing climate resilient development requires collaboration across political, institutional, economic, and cultural domains

Highlights

- Joint adaptation–mitigation strategies must be tailored to specific contexts.
- Building resilience requires coordinated action across sectors and scales.
- Agricultural adaptation can significantly boost overall resilience.
- A just energy transition depends on economic, social, and infrastructure resilience.
- Key CRD enablers include strong institutions, financing, collaboration, cultural engagement, and innovative forms of investment

"Successful action requires cross-scalar and cross-sector approaches"

About the study

- 124 semi-structured interviews with policymakers and practitioners (2023–2024), complemented by a review of scientific literature and policy documents.
- Case study: 3 vulnerable regions in Italy - Aosta Valley, Basilicata, Sardinia.
- Links national policy to local practice

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Project website

1. Perceived IMPACTS of climate change (from interviews)

Classified according to the thematic structure of the National Adaptation Plan

WATER

Water resources

Seasonal rainfall variability is increasing, with more frequent summer droughts and higher irrigation demand. Deep water withdrawals and salinisation are on the rise.

Marine ecosystems, coastal areas, and fisheries

Temperature changes, salinity, and acidification disrupt ecosystems, reduce native species and fishing yields, and promote erosion and harmful algal blooms.

Freshwater and transitional ecosystems

Thermal and hydrological changes harm biodiversity and infrastructure, altering water quality and composition.

Cryosphere and mountain areas

Retreating glaciers and diminishing snow cover impact the hydrological cycle, threaten alpine infrastructure and increase landslides, avalanches, and collapses.

HUMAN SOCIETY

Agriculture

Water stress, increased irrigation, and seasonal changes reduce yields and quality. Economic losses are rising due to plant diseases and pest infestations.

Energy

Unsustainable practices increase emissions. Hydropower declines while competition with agriculture for water resources intensifies.

Tourism

Glacier retreat reduces ski mountaineering opportunities. Scenic tourism is growing at lower elevations. Tourist seasons have shifted and lengthened across all regions, generating increased revenue for hospitality services.

SOIL

Terrestrial ecosystems, desertification, soil degradation, forests

Changing vegetation cycles reduce biodiversity and carbon storage. Alien species, salinisation, soil degradation, and more frequent wildfires increase pressure on ecosystems and land productivity.

Geological, hydrological, and hydraulic instability

Increased flood discharge and volumes are causing severe infrastructure damage and economic losses.

2. Reported RESPONSES to climate change (from interviews)

Classified according to the thematic structure of the National Adaptation Plan

WATER

Water resources

Responses include building interconnected dams, unifying water consortia, centralising governance, and setting up monitoring and planning systems.

Marine ecosystems, coastal areas, and fisheries

Adaptations involve offshore fishing, artificial reef deployment, fishing tourism, aquaculture, and selecting resilient species.

Freshwater and transitional ecosystems

Measures include resilient species selection, riverbed cleaning, and delegating water system maintenance to local farmers.

Cryosphere and mountain areas

Responses involve artificial snowmaking, shifting ski infrastructure to higher elevations, snow preservation through stockpiling and insulation, terrain cooling via drilled holes, and issuing frequent weather and extreme event bulletins.

HUMAN SOCIETY

Agriculture

Adaptations focus on drought- and heat-tolerant crops, adjusted calendars, no-tillage farming, greenhouse and barn cooling, smart irrigation, insurance schemes.

Energy

Measures include solar (photovoltaic, agrivoltaic), wind, hydro power, renewable energy communities, hydrogen trains, sustainable transport promotion, and low-emission building systems.

Tourism

Responses include diversifying year-round offers, increased marketing, artificial snow, sun-reflective covers, and geothermal or biomass heating for accommodation.

SOIL

Terrestrial ecosystems, desertification, soil degradation, forests

Regional conservation policies and land-use planning aim to combat land degradation and support sustainable forestry and timber management.

Geological, hydrological, and hydraulic instability

Preventive responses include land-use regulation and stricter building licence requirements to reduce risk in unstable areas.

CASE STUDY 1. Energy transition

Climate impacts on energy

Unsustainable energy practices intensify emissions and climate risks, while droughts and rainfall variability reduce hydropower, raise cooling demand and energy peaks, and intensify water competition between agriculture and energy.

Contrasting views on renewables

- **Energy colonialism: "*Wind turbines benefit outside investors but damage local landscapes*" (Sardinia)**
- **Local power generation: "*My photovoltaic system meets all my farm's energy needs*" (Basilicata)**


Photovoltaic, Sardinia

Key Responses

Rapid uptake of renewables
- Solar/wind widespread across Basilicata and Sardinia.

Low-carbon transport
- Uptake of e-mobility (Aosta Valley).
- Hydrogen trains piloted in Sardinia.

Local energy communities
- *"Solar heating pays back in two years, zero emissions"* (Basilicata).

Sustainable tourism
- Hotels use geothermal and woodchip: *"Attracts eco-tourists"* (Aosta Valley).

Hydropower
- 400+ plants active in Aosta Valley.

Challenges

Land use conflicts
- Defining "**suitable areas**" for renewables: *"Solar and wind impact landscape quality"* (Sardinia).

Energy colonialism concerns
- *"Resources are exploited by private firms with little local benefit" (Sardinia).*

Lack of transition strategy
- 88% of national emissions from services, industry, construction: *"Need concrete goals and initiatives" (Basilicata).*

Regulatory uncertainty (hydropower)
- *"Without concessions [expiring in 2029], we can't invest"* (Aosta Valley).

Enabling climate resilient energy transitions

Strategic vision and planning
- Develop a phased renewable roadmap balancing ecology, energy security, and equity.
- Decarbonise the highest emitting sectors while fostering adaptation in agriculture.

Inclusive energy models
- Strengthen local energy communities and fair benefit-sharing.

Financial alignment
- Integrate climate goals into budgets and align national, regional, and EU funding.

Technological innovation as an enabler
- Support community-driven adoption of renewables and low-carbon solutions.

Governance and clarity
- Ensure regulatory stability for hydropower.

CASE STUDY 2. Adaptation in agriculture and water

Climate impacts on agriculture and water

Climate change is reducing crop yields and farm incomes through water stress, shifting growing seasons, rising pests, and increased irrigation needs, driving groundwater overuse and salinisation amid frequent droughts.

Greenhouse heating system powered by biomass to cope with frosts

"*There is an urgent need to adapt the system to cool the greenhouses during heatwaves*" (Sardinia)

Key Responses

Crop diversification and species shift
- Heat- and drought-resistant crops adopted. "*Olives are replacing citrus*" (Basilicata).

Farming calendar adjustments
- "*Now we sow cereals 2 months later*" (Basilicata).

No-till farming and conservation agriculture
- "*Grew from 19 to 30 thousand ha under new CAP*" (Basilicata).

Heating and cooling systems
- Greenhouses and barns.

Centralised water governance
- "*No shortages since coordination began*" (Sardinia).

Smart tech and monitoring systems
- Precision irrigation, GPS tools. 200+ stations guide seasonal water allocations (Sardinia).

Crop insurance
- "*We insure against frost losses*" (Aosta Valley).

Challenges

Water stress
- Scarcity and growing competition between sectors.

Financial and policy gaps
- CAP subsidies are vital but often misaligned: "*Eco-schemes don't match local needs*" (Basilicata).

Uneven support
- "*Cereal growers have been left behind in the CAP*" while other sectors benefit more (olives).

Knowledge gaps
- Administrators lack tools. "*Adapting CAP requires technical expertise*"

Climate uncertainty
- Unpredictable trends hinder long-term planning.

Enabling agricultural and water adaptation

Build local capacity
- Strengthen stakeholder knowledge and adaptive policymaking based on local contexts.
- Promote CAP schemes tailored to local geographical and socio-technical conditions.

Align water governance and institutions
- Integrate EU, national, and local frameworks with clear coordination across levels (national, regional, consortia).

Back low-emission farming through adaptation
- Support mitigation (no-till, conservation practices, renewables) and adaptation (smart irrigation, crop shifts), using agriculture adaptation to reduce emissions beyond borders.

What conditions enable progress toward climate resilient development?

1. Political, institutional and planning

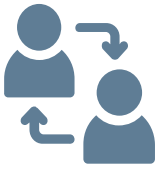
Aligning local adaptation with national and global decarbonisation:

- Develop integrated, cross-sector planning linking climate goals with sustainable development.
- Adopt a phased renewable energy transition that preserves resilience.
- Strengthen water governance through centralised coordination and monitoring.

2. Economic and financial context

Mobilising coordinated public and private investment:

- Embed climate resilient development in national and regional financial planning to ensure long-term funding.
- Align EU, national, and regional funds for coherent climate investment (e.g. PNRR, Next Generation EU, Horizon Europe, LIFE, EU Innovation Fund, ERDF, ESF+, and agricultural development funds).
- Engage the private sector to scale up climate finance.



3. Collaboration and capacity building

Strengthening cross-sector partnerships and capacity building for climate action:

- Support public administrators with the tools to interpret and implement climate policies effectively across sectors.
- Provide practical, tailored training to implement adaptation and mitigation in private sector planning and investment decisions.

4. Socio-cultural awareness and local motivation

Inspiring behavioural change through emotional and value-based engagement:

- Promote climate literacy and public awareness to support lasting behavioural change.
- Foster emotional engagement through cultural values.

5. Innovative forms of investment

Integrating technology and infrastructure with social realities:

- Design renewable infrastructure to respect community needs and landscape integrity.
- Support R&D in emerging tech like hydrogen for mobility, industry, heating.
- Promote smart irrigation and sensor-based water systems.

Further reading

- **Favretto N**, Stringer LC. Under review. Evidence-based steps towards climate resilient development pathways: Insights across scales and sectors. *Global Environmental Change*.
- **Favretto N**, Stringer LC. 2024. Climate resilient development in vulnerable geographies. *Mitigation and Adaptation Strategies for Global Change* 29: 90. [Download here]