CITTÀ IN TRANSIZIO

LE STRATEGIE DI ADATTAMENTO REGIONALI, I PIANI E PROGETTI DELLE CITTÀ

Università Iuav di Venezia

PLANNING CLIMATE CHANGE LAB

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Definizione di adattamento nel Governo del Territorio

Urban climate adaptation è il processo attraverso il quale un sistema urbano (**popolazioni, infrastrutture, ecosistemi e governance**) progetta e implementa misure per **ridurre vulnerabilità e rischi climatici**, proteggere le funzioni critiche della città e mantenere la qualità della vita di fronte agli impatti climatici presenti e futuri.

Sustainability Directory / EEA

Definizione di adattamento nel Governo del Territorio

Quali impatti?
Dove si concentrano? (eventualmente anche sovrappongono?)

Quali interventi? (pubblico - privato, spazi, riconversioni)
Quali strumenti e a che scale?

RICOGNIZIONE DEGLI IMPATTI CLIMATICI PER IL VENETO

FASE I: analisi e studio *degli impatti climatici osservati e previsti dal* **Report ARPAV** sul **CC** in **Veneto** *e dal* **PNACC**.
Gli impatti sono stati suddivisi tra loro secondo una causa climatica prioritaria; tuttavia, nella categorizzazione tra **CAUSE CLIMATICHE - IMPATTO,** *si è tenuto conto anche della possibile interazione cumulativa e dell'interdipendenza tra le diverse cause climatiche nel concorrere a generare gli impatti.*

01.

CAUSA CLIMATICA

AUMENTO DELLE TEMPERATURE MEDIE STAGIONALI:

IMPATTI

- *Shifting altitudinale di specie animali e vegetali;*
- *Comparsa di malattie vegetali e parassitosi;*
- *Effetto isola di calore in ambiente urbano;*
- *Comparsa di nuove disfunzioni, malattie e agenti virali pericolosi per la salute umana;*
- *Aumento del fabbisogno energetico per il raffrescamento;*
- *Perdita di nevai*

02.

CAUSA CLIMATICA

VARIAZIONE DEL REGIME DI PRECIPITAZIONE:

IMPATTI

- *Fenomeni di dissesto idrogeologico, fluviale o di versante;*
- *Carenza idrica e siccità agonomica;*
- *Alterazione dei cicli agronomici;*
- *Formazione di incendi boschivi;*
- *Perdita di biodiversità nelle acque interne e di transizione;*
- *Vento forte e comparsa di ciclonidi carattere tropicale;*
- *Allagamenti localizzati in zone urbane;*
- *Erosione idrica del suolo*

03.

CAUSA CLIMATICA

INNALZAMENTO DEL LIVELLO DEL MARE:

IMPATTI

- *Inondazioni permanenti in zone costiere depresse;*
- *Risalita del cuneo salino negli ambienti di transizione;*
- *Fenomeni di mareggiata molto intensi lungo la costa;*

METODOLOGIA E OBIETTIVO

COSTRUZIONE DELLE FASI DI LAVORO

OBIETTIVO: MAPPATURA DEI PIANI

Eseguire una ricognizione degli strumenti di pianificazione regionali, per tutti gli aspetti correlati al cambiamento climatico con individuazione delle misure di mitigazione e di adattamento che tengono come riferimento specifici impatti:

1) Già previste ed attive;
2) Degli ambiti di intervento non ancora presidiati;

I

Analisi e studio *degli impatti climatici osservati e/o previsti in Regione Veneto.*

(con riferimento PNACC e Report ARPAV)

II

Analisi *degli strumenti di pianificazione regionale vigenti, in relazione agli impatti climatici di FASE I.*

III

Operatività: *ricognizione dello stato di fatto per le misure già previste ed attualmente attive in termini di adattamento su scala regionale.*

Criteri di valutazione dei piani e programmi

Riepilogo degli aspetti chiave

Gli strumenti di piano e i programmi contengono :	
Misure esplicite	*definite appositamente in risposta ai cambiamenti climatici*
Misure implicite	*non appositamente definite come risposta ai cambiamenti climatici, ma utili anche per l'adattamento*

CrossMark

LETTER

OPEN ACCESS

RECEIVED
20 August 2015

Measuring and tracking the flow of climate change adaptation aid to the developing world

Simon D Donner[1], Milind Kandlikar[2,3] and Sophie Webber[4]

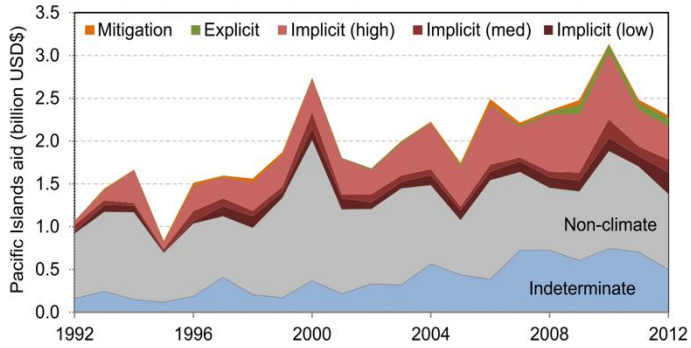
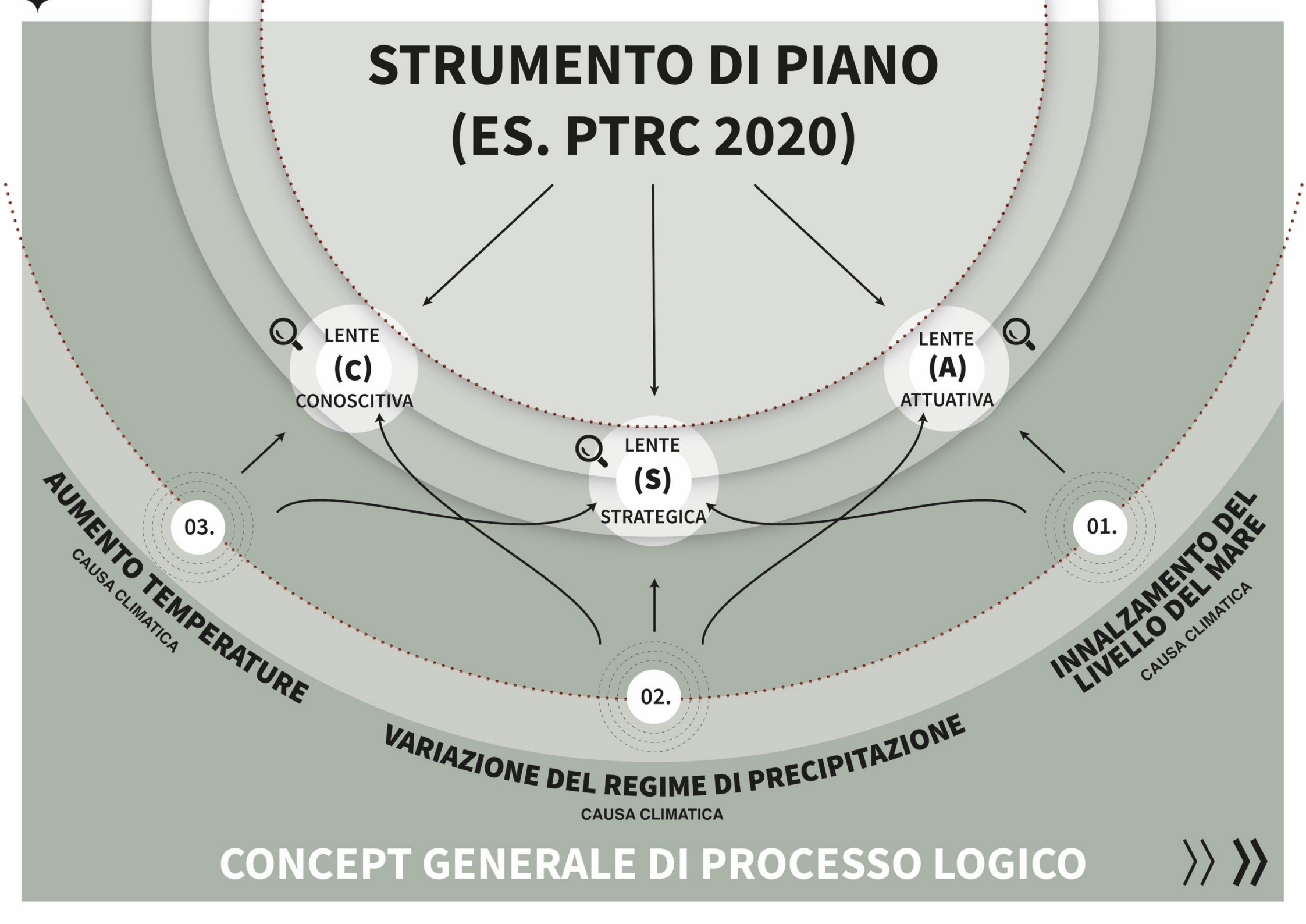


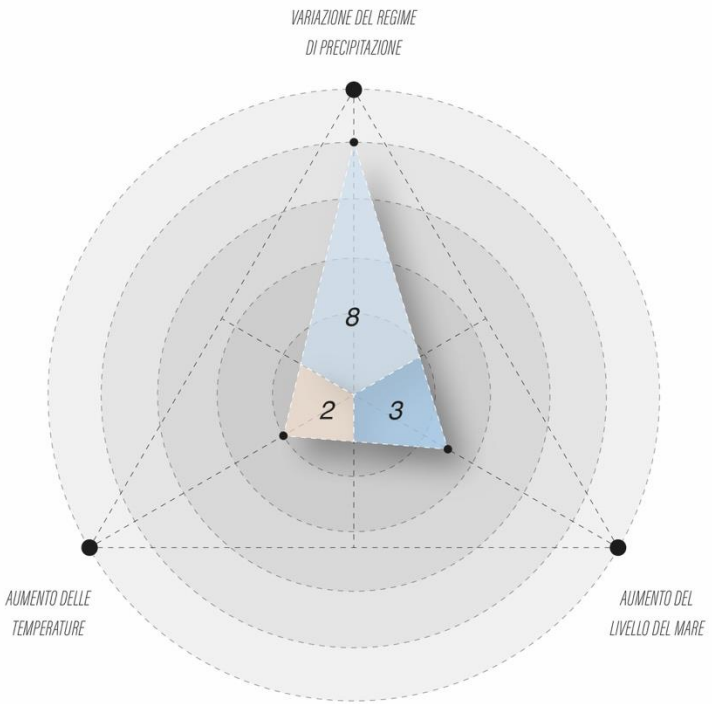
Figure 1. Total overseas development assistance (ODA) to Oceania from 1992 to 2012. The chart shows total ODA to the Pacific Islands classified as explicit adaptation, mitigation, implicit adaptation (low, medium and high scenarios), not climate-related or indeterminate based on the analysis in this study. All values are based on 2011 USD.


STRUMENTO DI PIANO
(ES. PTRC 2020)
LENTE
(C)
CONOSCITIVA
LENTE
(A)
ATTUATIVA
LENTE
(S)
STRATEGICA
03.
01.
02.
AUMENTO TEMPERATURE
CAUSA CLIMATICA
INNALZAMENTO DEL LIVELLO DEL MARE
CAUSA CLIMATICA
VARIAZIONE DEL REGIME DI PRECIPITAZIONE
CAUSA CLIMATICA
CONCEPT GENERALE DI PROCESSO LOGICO

PIANO TERRITORIALE REGIONALE di CORDINAMENTO (PTRC)

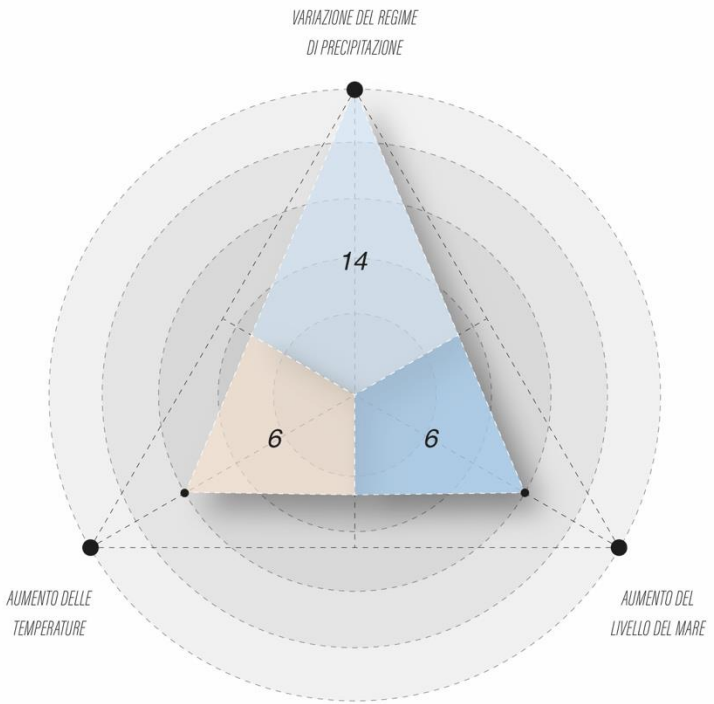
RADAR DELLE MISURE DI ADATTAMENTO

C - QUADRO CONOSCITIVO



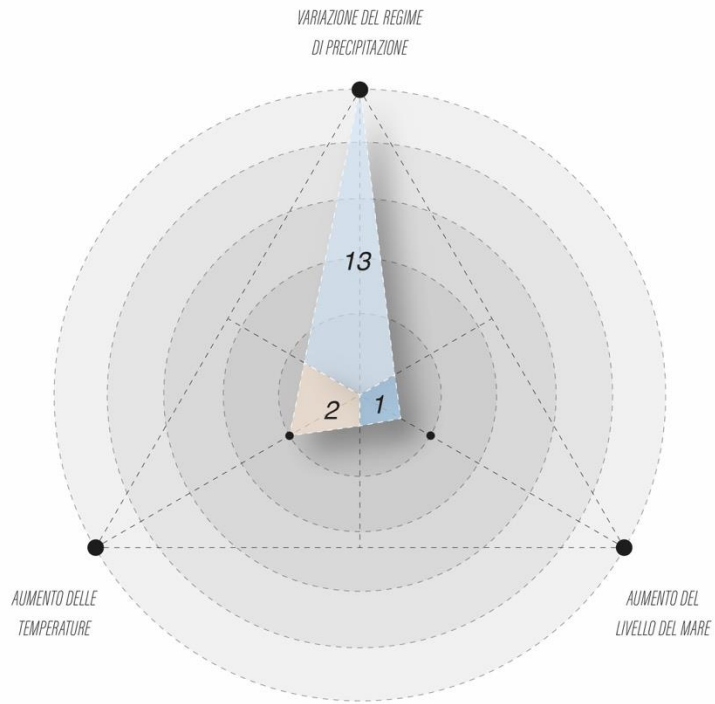
S - LIVELLO STRATEGICO

Relazione Illustrativa

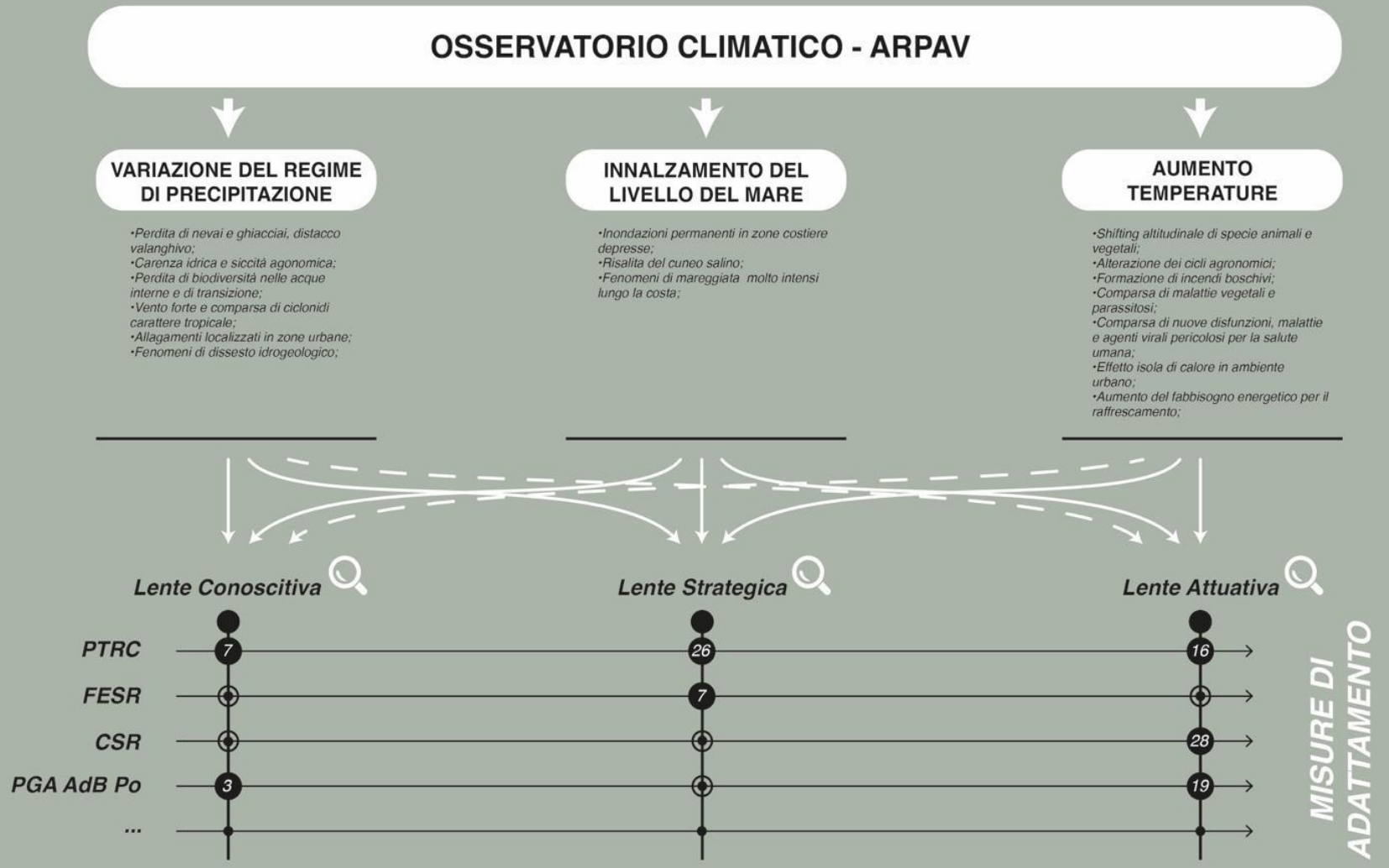


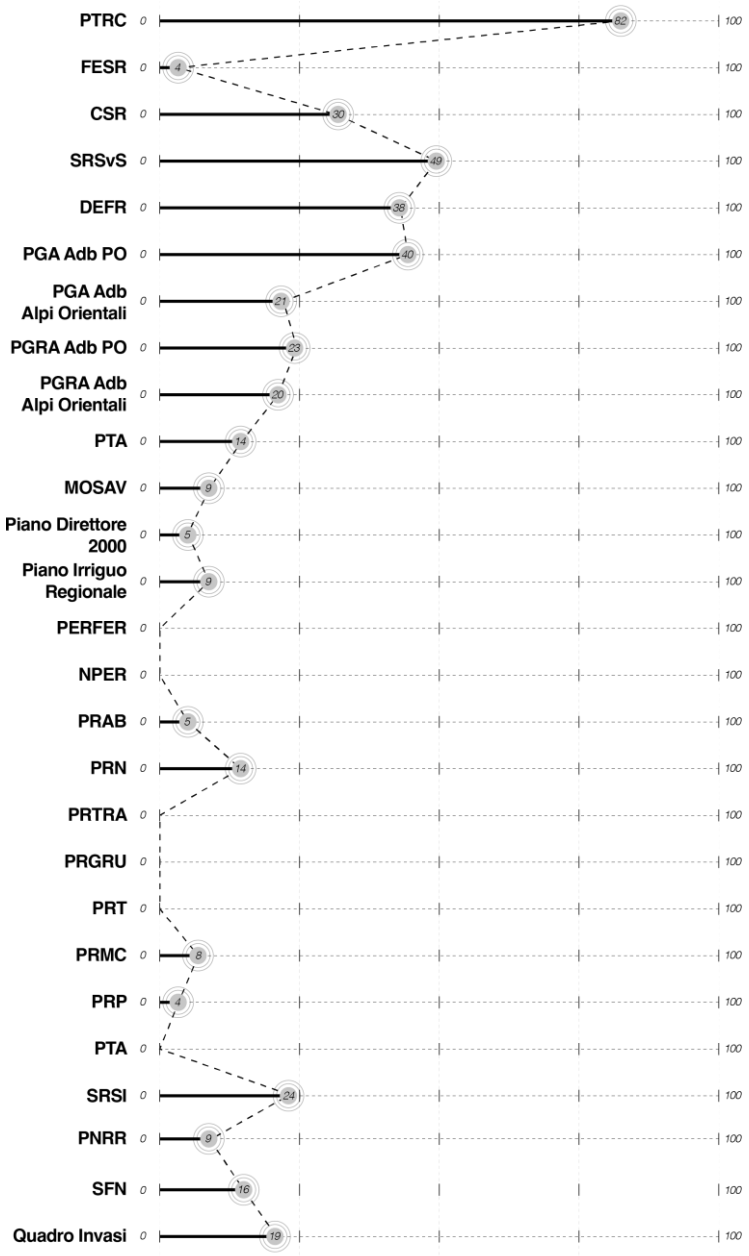
A - ATTUATIVO

Norme Tecniche

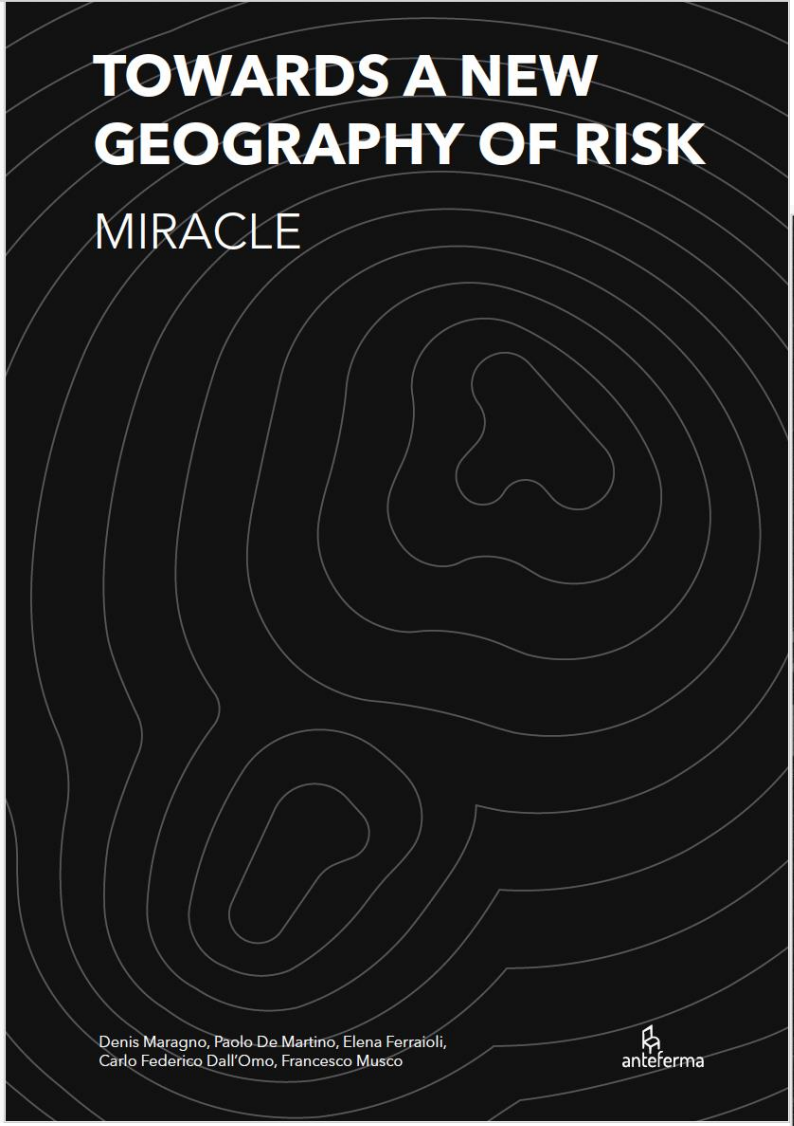


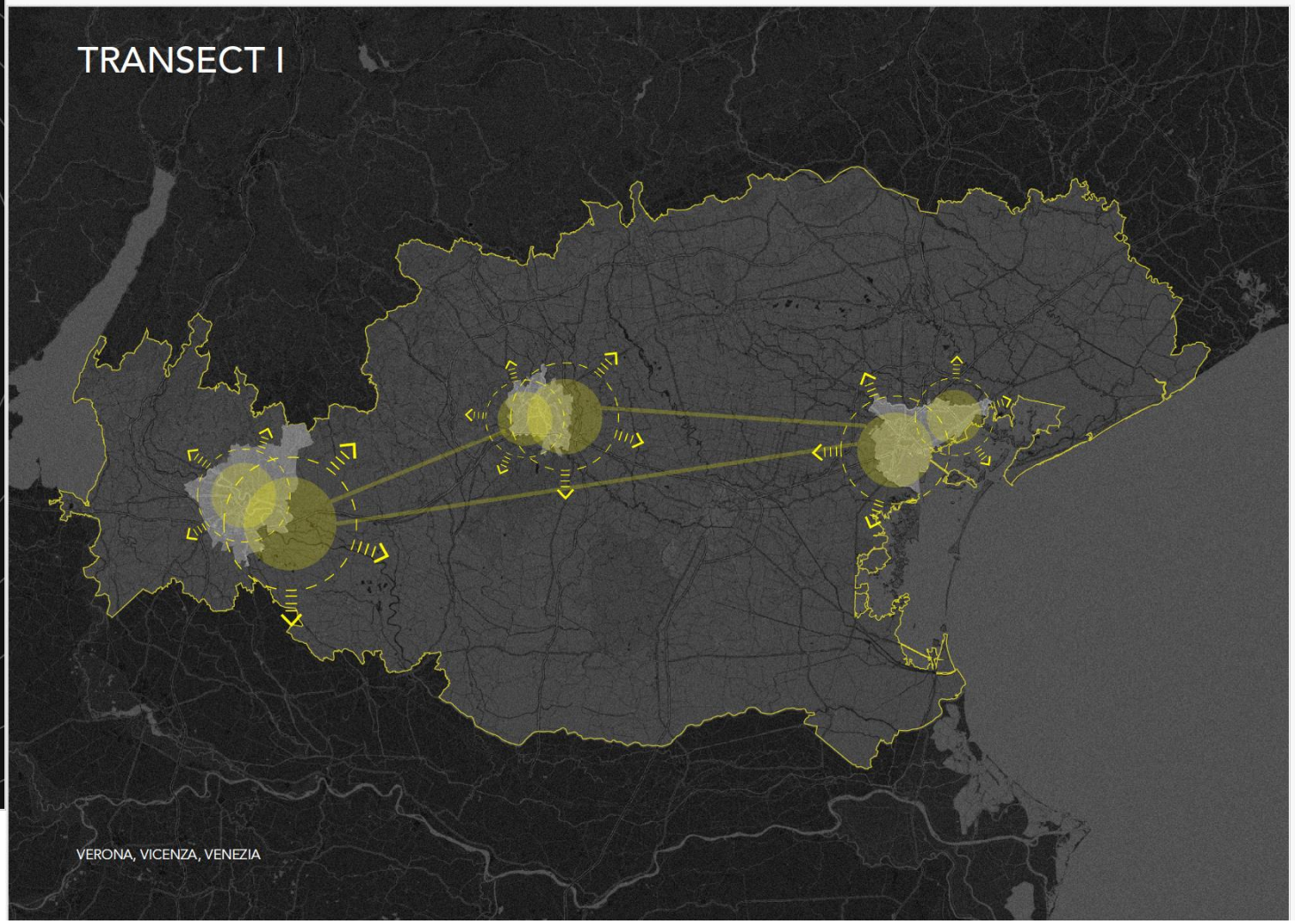
SVILUPPO DEL PROCESSO LOGICO





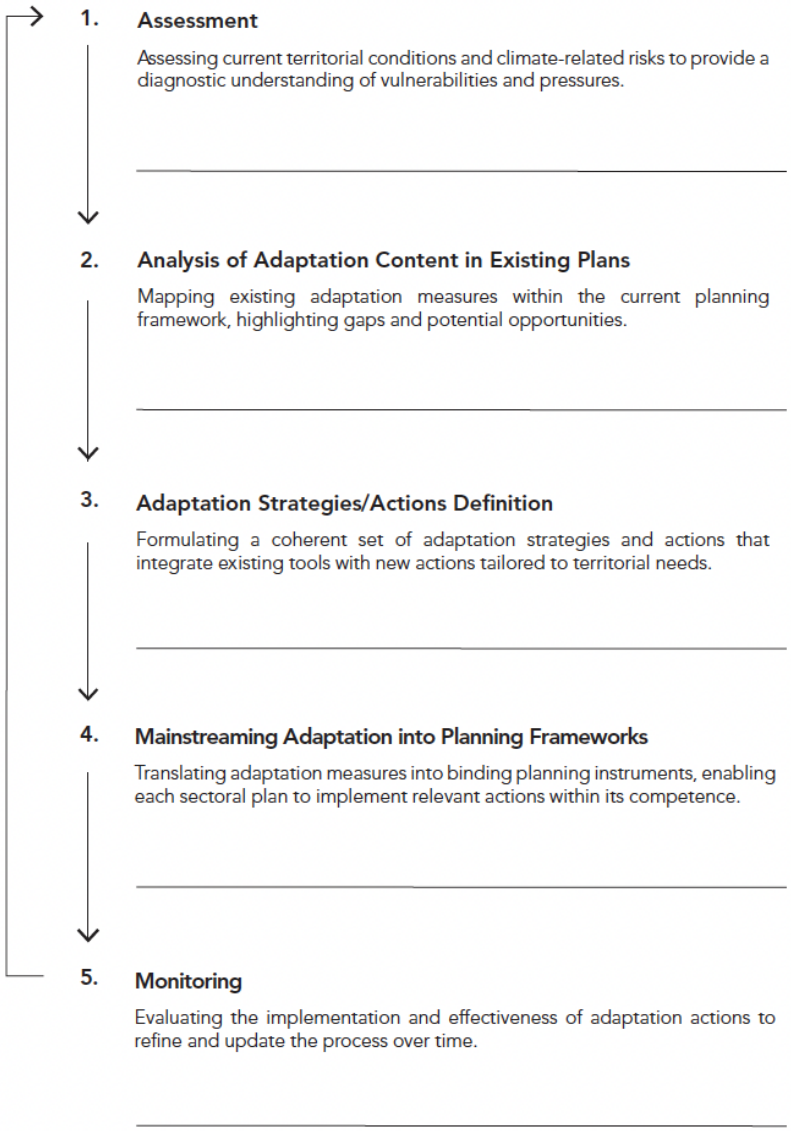
Aree	Direzioni	Acronimo del piano	N. misure	N. totale di misure per area	
Area Infrastrutture, Trasporti, Lavori Pubblici, Demanio	• *Direzione Pianificazione Territoriale;* • *Direzione Infrastrutture e Trasporti;*	*PTRC2020*	82	104	67
		PRT	0		15
		PRMC	8		22
		PRN	14		
Area Tutela e Sicurezza del Territorio	• *Direzione Ambiente e Transizione Ecologica;* • *Direzione Difesa del Suolo e della Costa;* • *Direzione Progetti Speciali per Venezia;* • *Direzione Uffici Territoriali per il Dissesto Idrogeologico;* • *Direzione Foreste, Selvicoltura e Sistemazioni Idraulico Forestali;* • *Protezione Civile, Sicurezza e Polizia Locale;*	*PRTRA*	0	123	98
		PRBAI	0		
		PGA Adb PO	40		21
		PGA Adb Alpi Orientali	21		
		PGRA Adb PO	23		
		PGRA Adb Alpi Orientali	20		
		MOSAV	0		
		PTA	9		4
		Piano Direttore 2000	5		
		PRAB	5		
Area Politiche Economiche, Capitale Umano e Programmazione Comunitaria	• *Direzione Programmazione Unitaria;* • *Direzione Ricerca Innovazione ed Energia;*	*FESR*	4	28	7
		PERFER	0		9
		NPER	0		12
		SRSI	24		
Area Marketing Territoriale, Cultura, Turismo, Agricoltura e Sport	• *Direzione Turismo;* • *Direzione ADG FEASR Bonifica e Irrigazione;* • *Direzione Agroambiente, Programmazione e Gestione Ittica e Faunistico-Venatoria;*	*PTA*	0	30	23
		PERFER	0		0
		CSR	30		7
Segreteria Generale della Programmazione	• *Direzione Sistema dei Controlli, Attività Ispettive e SISTAR;*	*DEFR*	38	87	47
		SRSvS	49		11
					29
Area Risorse Finanziarie, Strumentali, ICT ed Enti Locali	/	*DEFR*	38	38	17
					11
					10
Area Sanità e Sociale	• *Direzione Prevenzione, Sicurezza Alimentare, Veterinaria;*	*PRP*	4	4	3
					0
					1





Publication of the project **MIRACLE - Multi-risk Integrated Resilience Approach for Coastal Landscapes and Environment**
Within the framework of RETURN – multi-Risk sciEnce for resilienT commUnities undeR a chaNging climate. Spoke 5 – TS1: Urban and Metropolitan Settlements

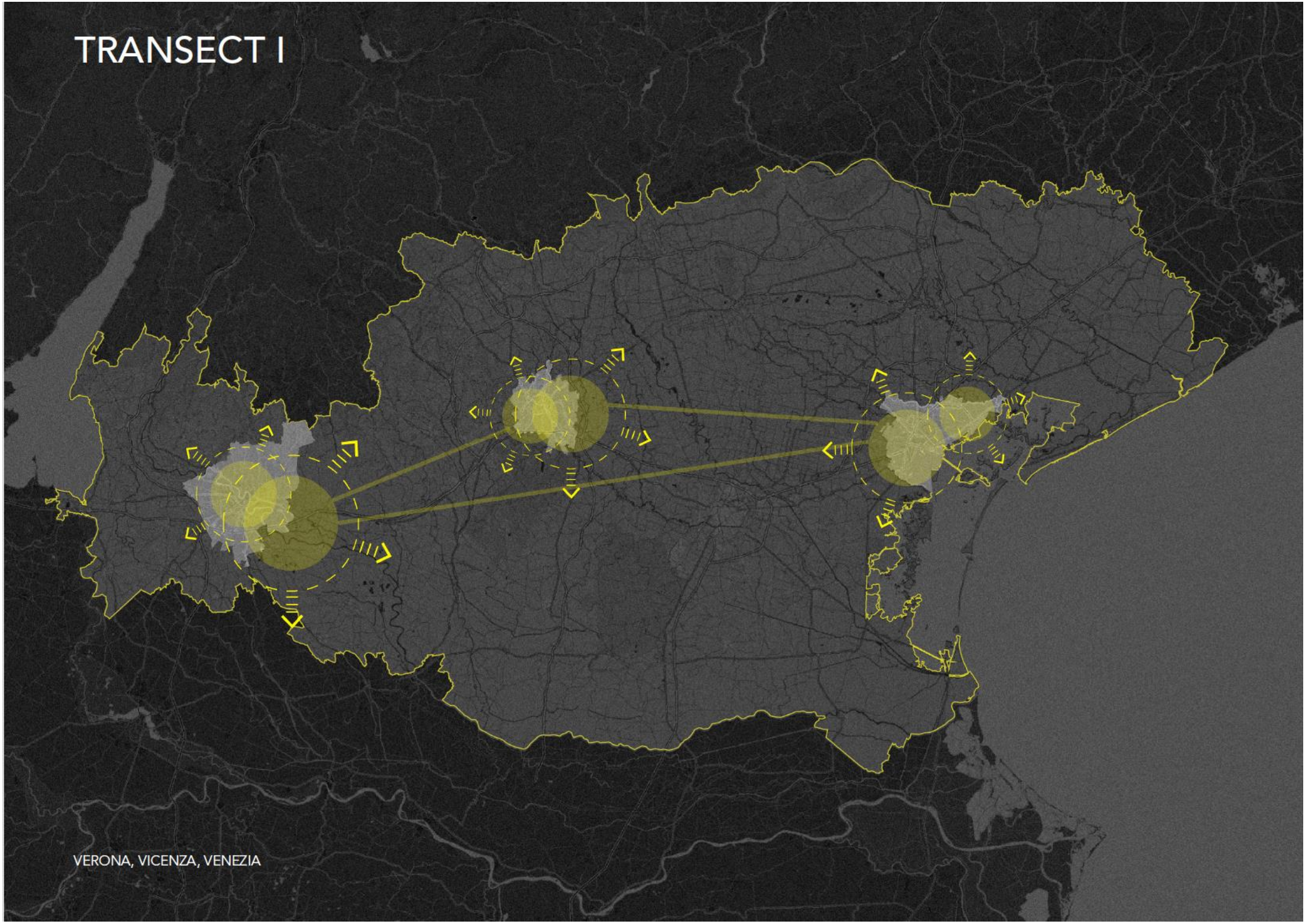
INTEGRATED CLIMATE ADAPTATION FRAMEWORK



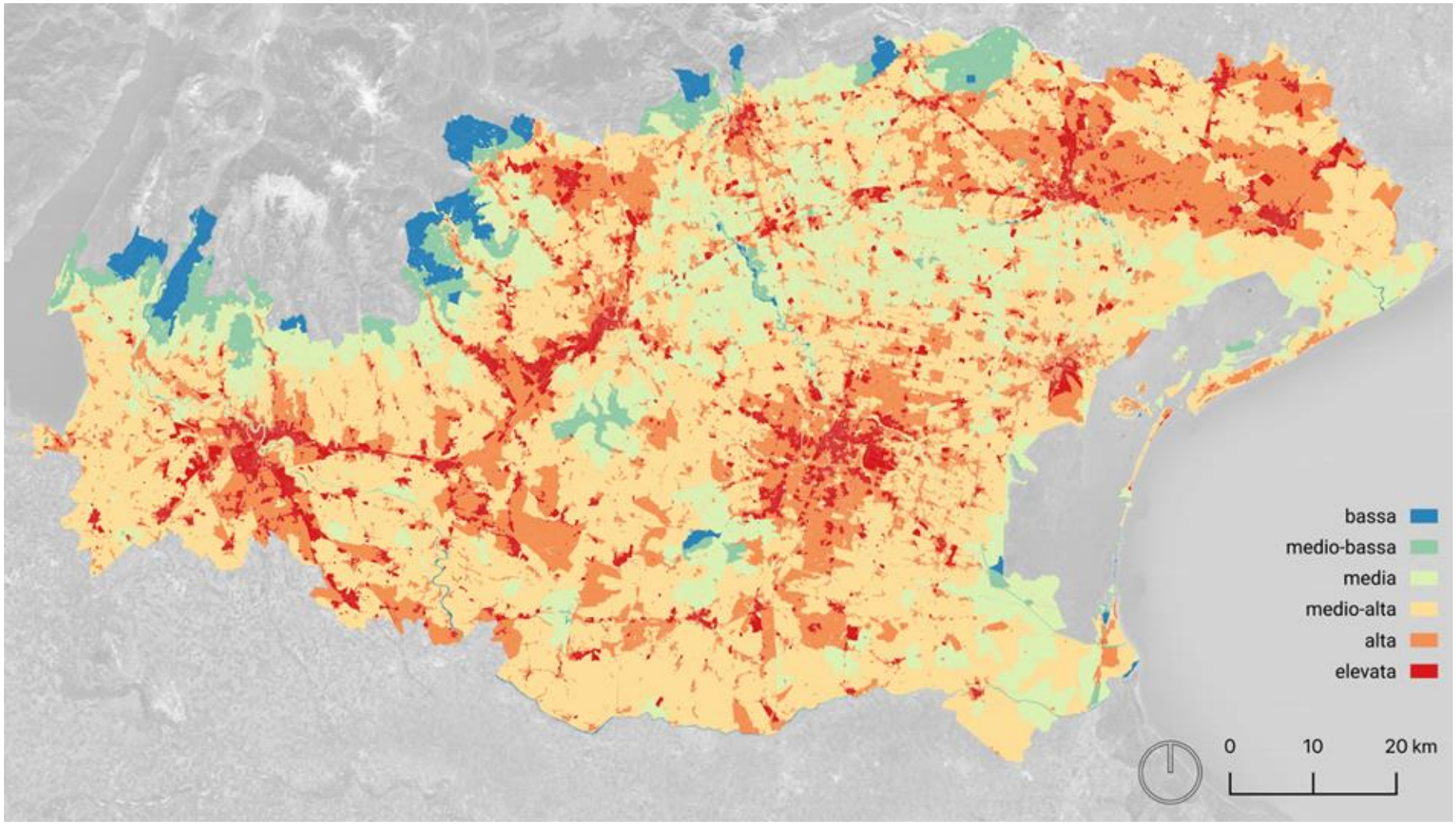
The Integrated Climate Adaptation Framework represents the general methodological framework for climate adaptation and climate-adaptive spatial planning developed within the MIRACLE project. It is conceived as a structured yet flexible process that supports the integration of climate adaptation into planning and design practices, addressing climate risks as spatial, systemic, and governance-related challenges. Rather than a linear sequence of actions, the framework operates as an iterative and circular process, in which knowledge, strategies, planning instruments, and monitoring continuously inform and recalibrate one another.
The framework responds to structural gaps that characterise contemporary planning systems. While climate risks are increasingly recognised in policy agendas, they are often addressed through sectoral measures, fragmented tools, or non-binding strategies that remain disconnected from spatial decision-making and regulatory frameworks. As a result, adaptation frequently operates in parallel to planning, rather than through it. The framework explicitly tackles this disconnection by positioning spatial planning as a key interface between risk assessment, design-driven strategies, and implementation mechanisms.

1. The first phase, **Assessment**, builds a shared diagnostic understanding of territorial conditions by identifying climate-related hazards, vulnerabilities, and pressures. Risk is framed not as an isolated environmental issue but as a spatial condition shaped by land use, infrastructures, ecological systems, and socio-territorial dynamics.
2. The second phase, **Analysis of adaptation content in existing plans**, critically examines how adaptation is already embedded — explicitly or implicitly — within current planning instruments. By mapping existing measures, prescriptions, and objectives across scales, this phase highlights institutional overlaps, regulatory inconsistencies, and missed opportunities, revealing where adaptation is present, where it is weak, and where it is absent.
3. Based on this analytical groundwork, **Adaptation strategies and actions definition** formulates a coherent set of spatial strategies and actions tailored to territorial specificities. This phase does not replace existing tools but reworks them, combining planning knowledge with spatial design and scenario-building to transform climate risks into opportunities for environmental regeneration, spatial reconfiguration, and improved habitability.
4. **Mainstreaming adaptation into planning frameworks** constitutes a crucial step in overcoming the implementation gap. Here, adaptation strategies are translated into binding, operational, or enabling planning instruments, assigning clear roles to statutory plans, sectoral tools, and governance mechanisms. Adaptation is thus embedded within ordinary planning processes rather than treated as an external or exceptional layer.
5. Finally, **Monitoring** closes and reopens the cycle, introducing feedback mechanisms to evaluate implementation and effectiveness over time. Through indicators and iterative revision, adaptation becomes a learning-oriented process, capable of evolving in response to changing climatic, environmental, and socio-spatial conditions.

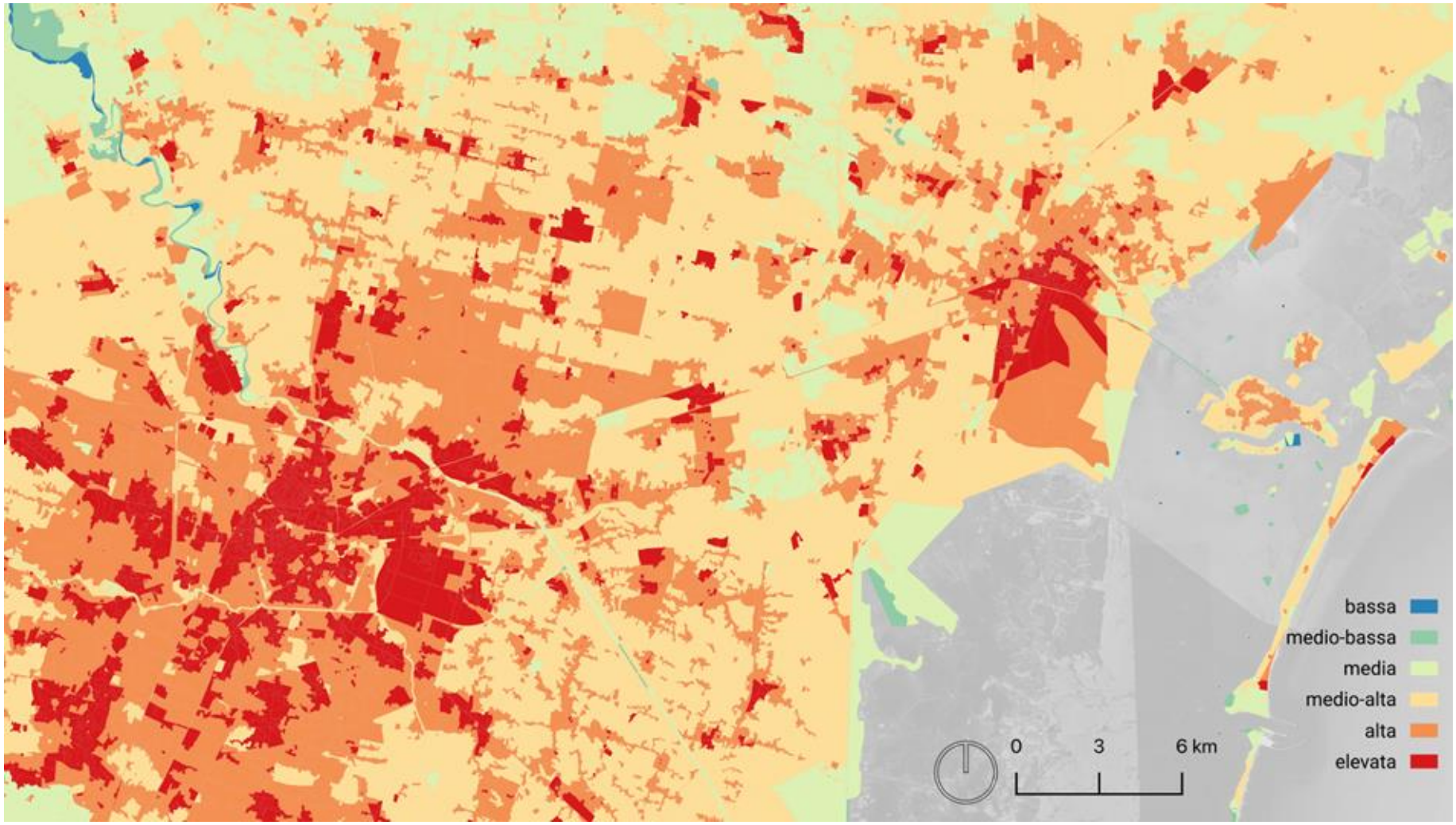
Within MIRACLE and throughout this book, the framework functions as a common interpretative and operational structure across diverse territorial contexts. It enables comparison while preserving specificity, offering a shared language to connect risk analysis, spatial strategies, and planning integration, and to advance a more robust and actionable approach to climate-adaptive planning.

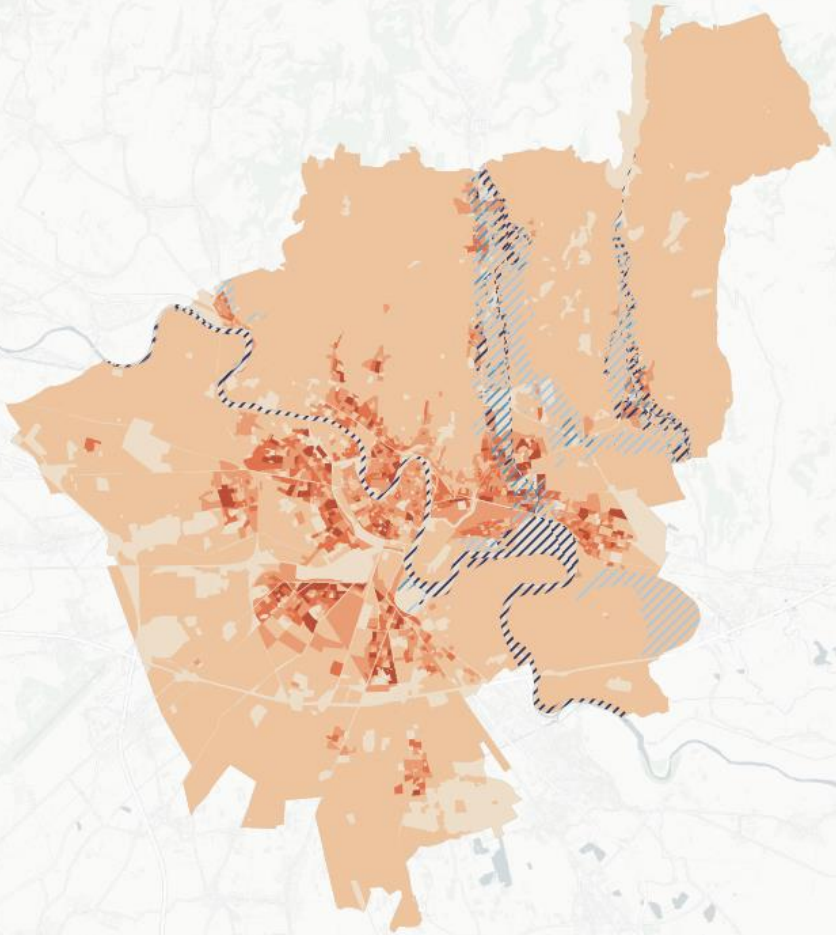

TRANSECT I
VERONA, VICENZA, VENEZIA

Valutazione delle temperature superficiali



Valutazione delle temperature superficiali





0 1,5 3 km

| MULTI-RISK FRAMEWORK

The multi-risk map combines heatwave risk and hydraulic risk to identify areas where multiple climate-related hazards overlap within the municipality of Verona. Higher multi-risk levels are mainly concentrated in the central urban area and along the river, where high exposure to heat stress coincides with zones subject to flooding. Conversely, peripheral and hilly zones generally display lower multi-risk values, as reduced urbanisation and favourable topographic conditions mitigate both thermal and hydraulic hazards. The map highlights priority areas for integrated risk reduction and adaptation strategies.

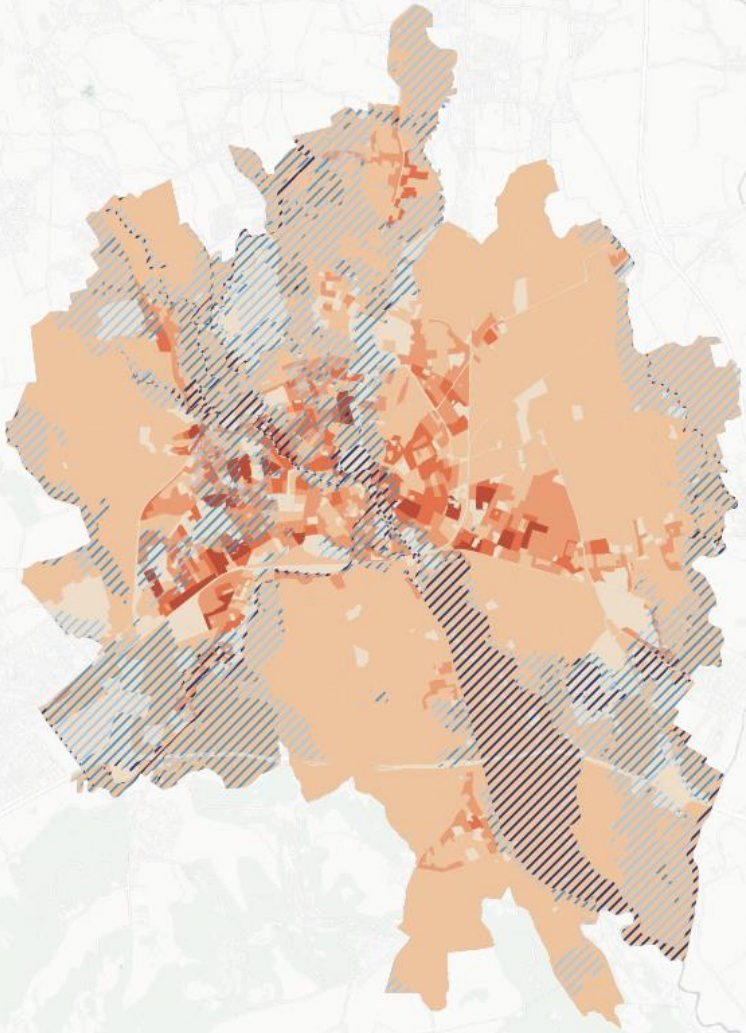
LEGEND

Hydraulic risk

- Low
- Medium
- High

Heatwave risk

- Low
- Medium
- Medium-high
- High
- Very high



0 1 2 km

| MULTI-RISK FRAMEWORK

The multi-risk map integrates heatwave risk and hydraulic risk to identify areas where multiple climate-related hazards intersect within the municipality of Vicenza. Higher multi-risk levels are primarily concentrated in the central urban area and along the tivers, where elevated exposure to heat stress overlaps with zones subject to medium and high flood risk. Additional critical areas emerge in densely built-up sectors with limited adaptive capacity. In contrast, peripheral zones generally show lower multi-risk values, as lower urban density and more favourable environmental conditions reduce the combined impact of thermal and hydraulic hazards.

LEGEND

Hydraulic risk

- Low
- Medium
- High

Heatwave risk

- Low
- Medium
- Medium-high
- High
- Very high

The selection of critical risk classes aimed to highlight areas most exposed to overlapping hazards and to support a clear multi-risk synthesis. For heatwave risk, the fourth and fifth classes were selected, as they represent the highest risk levels. For hydraulic risk, the medium and high classes were considered due to their relevant flood potential. These classes were assigned the symbology of the highest risk levels to homogenise the visual representation. The resulting multi-risk map provides a synthetic framework to identify critical elements and to support the definition of targeted strategies.

LEGEND

Hydraulic risk

High

Heatwave risk

Very high

0 1,5 3 km

1. Assessment

Assessing current territorial conditions and climate-related risks to provide a diagnostic understanding of vulnerabilities and pressures.

- **Hydraulic risk**
- **Heatwave risk**

2. Analysis of Adaptation Content in Existing Plans

Mapping existing adaptation measures within the current planning framework, highlighting gaps and potential opportunities.

REGIONAL

- **PTRC – Regional Territorial Coordination Plan**. climate-resilient territorial development; ecological networks and hydraulic corridors; soil permeability and land-use guidance.
- **PPR – Regional Landscape Plan**. landscape unit prescriptions; protection of river corridors and sensitive areas; constraints on transformations affecting landscape and ecosystems.
- **PTA – Water Protection Plan**. hydraulic risk prevention; protection of water bodies and floodplains; measures for water quality, runoff control and flood mitigation.

LOCAL

- **PAT – Territorial Planning Framework**. incorporation of adaptation measures into zoning and land-use regulations, with a focus on hydraulic risk areas, urban margins and transformation sites.
- **PAESC/SECAP – Sustainable Energy and Climate Action Plan**. operational activation of climate adaptation actions addressing urban heat stress, microclimate regulation and mobility-related emissions.
- **Urban Green Regulation**. implementation of green infrastructure and ecosystem-based solutions to support microclimate regulation, ecological continuity and permeable urban edges.

3. Adaptation Strategies/Actions Definition

Formulating a coherent set of adaptation strategies and actions that integrate existing tools with new actions tailored to territorial needs.

- Strengthening water management and soil stability to reduce hydrogeological vulnerability
- Enhancing urban microclimate and environmental performance through widespread green infrastructure
- Reconfiguring mobility networks to reduce pressure and improve accessibility
- Transforming urban and territorial margins into permeable ecological and social interfaces

4. Mainstreaming Adaptation into Planning Frameworks

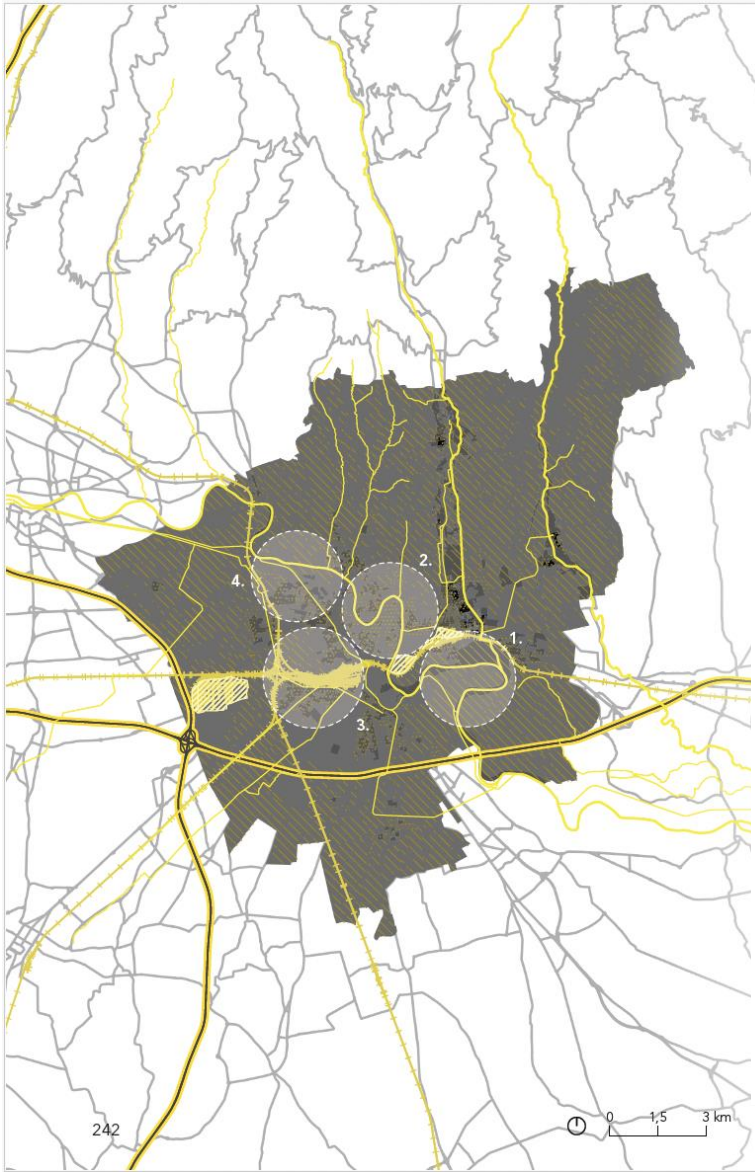
Translating adaptation measures into binding planning instruments, enabling each sectoral plan to implement relevant actions within its competence.

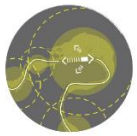
- **PAT – Territorial Planning Framework**. incorporation of adaptation measures into zoning and land-use regulations, with a focus on hydraulic risk areas, urban margins and transformation sites.
- **PAESC/SECAP – Sustainable Energy and Climate Action Plan**. operational activation of climate adaptation actions addressing urban heat stress, microclimate regulation and mobility-related emissions.
- **Urban Green Regulation**. implementation of green infrastructure and ecosystem-based solutions to support microclimate regulation, ecological continuity and permeable urban edges.

5. Monitoring

Evaluating the implementation and effectiveness of adaptation actions to refine and update the process over time.

- Checking integration of measures into plans
- Assessing effectiveness through indicators
- Iterative revision of measures and planning tools.

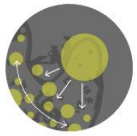




1. Water and soil fragility

Strategy: Strengthening water management and soil stability to reduce hydrogeological vulnerability

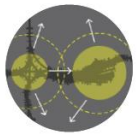
The relationship between water, soil, and settlements emerges as a priority. Areas in the northeast and along the Adige corridor show significant hydrogeological vulnerability, flood exposure, and unstable soils. These conditions highlight the need for structural and preventive interventions capable of improving water management, reducing downstream risk, and strengthening the ecological and territorial role of the river system.



2. Environment and quality of life

Strategy: Enhancing urban microclimate and environmental performance through widespread green infrastructure

Environmental pressures manifest in multiple forms: air pollution in the western part of the city, intense heat accumulation in the historic centre, and a fragmented ecological network that limits natural cooling and ecological functioning. Reconceiving the territory as an ecological infrastructure — through depaving, expanding tree canopies, and introducing urban forests — becomes essential to regenerate public spaces and enhance overall environmental quality.



3. Mobility and critical infrastructures

Strategy: Reconfiguring mobility networks to reduce pressure and improve accessibility

The city remains strongly dependent on road traffic, including flows of hazardous goods, which place heavy pressure on infrastructures and urban space. Mobility must therefore be rethought not only to reduce emissions and improve safety, but also to create new spatial opportunities, strengthen rail connections, and support a more accessible and resilient urban environment.

4. Porous edges

Strategy: Transforming urban and territorial margins into permeable ecological and social interfaces

Verona's edges and transitional landscapes form a patchwork of discontinuities, marginal spaces, and fragmented systems. Rather than being treated as limits, these areas can become permeable and connective interfaces capable of stitching together ecological corridors, enabling new forms of public space, and supporting broader territorial regeneration.

Action Cluster A – Flood Regulation Infrastructure

1. Develop floodwater diversion canals and bypass channels
2. Construct retention basins and attenuation ponds in agricultural and peri-urban areas

Action Cluster B – Nature-Based Water Systems

3. Create urban wetlands and phytodepuration zones along river branches

Action Cluster A – Greening for Microclimate

1. Develop ground-based green facades
2. Install green roofs on public and private buildings

Action Cluster B – Greening Mobility Corridors

3. Promote public transport and active travel (walking and cycling).
4. Plant street-tree canopies along mobility and logistics corridors.

Actions Cluster – Station Area Regeneration

1. Redevelop station-area spaces by transforming building backs into public-facing edges and green public areas.
2. Place the rail line below ground and create a continuous system of parks and public green spaces along the former rail corridor.

Action Cluster – Ecological Corridors and Permeable Margins

1. Develop reforestation and ecological corridors along urban and territorial edges.
2. Create breathing edges in vacant and transitional areas.

GRAZIE
PER L'ATTENZIONE

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