

POINT REVIEW OF INDUSTRIAL TRANSITION OF ANDALUSIA

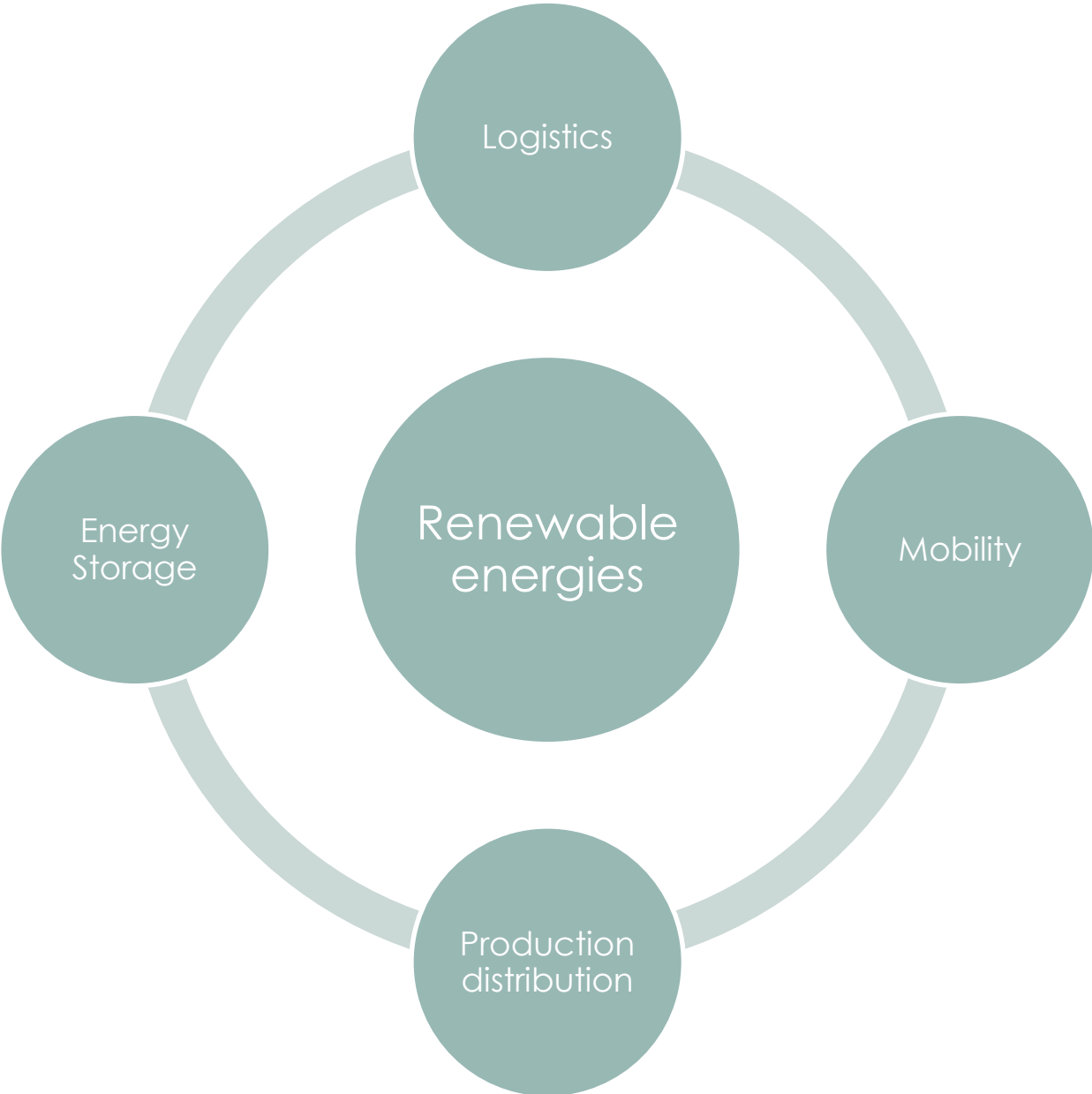
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UMIT Working Group, 15/07/2020

CONTENT

- Description of the theme of the industrial transition in Andalusia: nexus of renewable, storage, logistics
- Key priorities, strategies and actors
- Context: national and European targets for the transition
- Analysis by headline functions:
 - Orientation & planning,
 - Resources mobilization,
 - Production,
 - Consumption & uses
- Synthesis

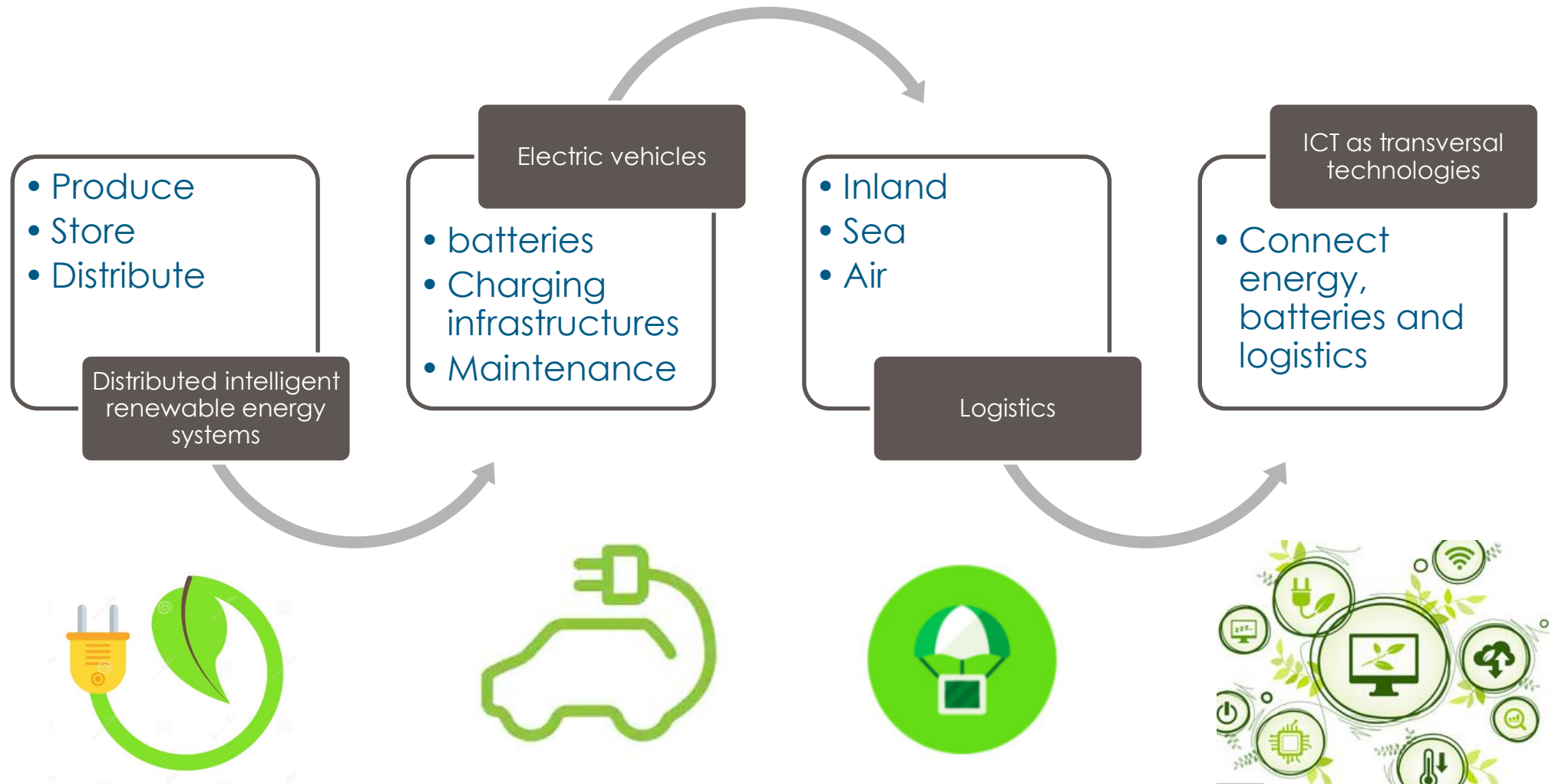
THEME OF THE INDUSTRIAL TRANSITION FOR ANDALUSIA



SELECTED RIS3 PRIORITY AREAS FOR THE INDUSTRIAL REVIEW FOR ANDALUSIA

| | |
|---|---|
| Promotion of Renewable Energies | Energy Efficiency - generation and integration systems of renewable energies. Smart energy networks (smart grids): capture, transformation, transport and storage. High capacity energy storage systems. Efficient energy management in production activities. |
| Transport and logistics | Innovative business activities on logistics and transport, particularly regarding the major productive sectors in Andalucía (agri-food, aeronautics, energy sectors); mobility and urban transport infrastructures. |
| Advanced Transport Systems and advance manufacturing | Development of Advanced Transport Systems, new materials and production processes for the transport industry, including autonomous systems (UAV, AGV); new developments in electric vehicles; advanced manufacturing technologies and systems for the transport industry. |
| Digital Economy | Incorporation of ICT infrastructure, development, and digital processes to strategic industries, business activities, civil society and for the development of e-government. This will include IoT, Big Data, Cloud Computing, etc. |

KEY AREAS DEVELOPED BY ANDALUSIA



THEMATIC FRAMING OF THE INDUSTRIAL SYSTEM IN REVIEW

| Scientific fields (OECD FOS) | Technologies (WIPO IPC) | Products / Artefacts and/or Services | Market Actors (only examples, see listings in Chapter 2) | Public Actors (examples, see listings in Chapter 2) |
|--|---|--|--|--|
| 1.1 Mathematics 1.2 Computer and information sciences 1.3 Physical sciences 1.4 Chemical sciences 1.5 Earth and related environmental sciences 2.1 Civil engineering 2.2 Electrical engineering, electronic engineering, information engineering 2.3 Mechanical engineering 2.4 Chemical engineering 2.5 Materials engineering 2.7 Environmental engineering 2.10 Nano-technology 5.2 Economics and business 5.3 Educational sciences 5.3 Sociology 5.5 Law 5.6 Political Science 5.7 Social and economic geography | b60 vehicles in general h01 basic electric elements h02 generation, conversion, or distribution of electric power h03 basic electronic circuitry h04 electric communication technique -- | 26.1 Electronic components and boards 26.2 Computers and peripheral equipment 26.3 Communication equipment 26.5 Measuring, testing and navigating equipment; watches and clocks 27.1 Electric motors, generators, transformers and electricity distribution and control apparatus 27.2 Batteries and accumulator 27.3 Wiring and wiring devices 30 Other transport equipment 30.3 Air and spacecraft and related machinery 30.9 Transport equipment n.e.c. 33 Repair and installation services of machinery and equipment 33.1 Repair services of fabricated metal products, machinery and equipment 33.2 Installation services of industrial machinery and equipment 35.1 Electricity, transmission and distribution services 49 Land transport services and transport services via pipelines 50 Water transport services 51 Air transport services 52 Warehousing and support services for transportation 53 Postal and courier services | Energy distributors (e.g. CIDE Asociación de pequeñas distribuidoras de energía eléctrica) Energy technology providers (e.g. A3E la Asociación de Empresas de Eficiencia Energética, UNEF: Unión Española Fotovoltaica, APPA Asociación de Empresas de Energías Renovables, ANPIER (Asociación Nacional de Productores de Energía Fotovoltaica, CLANER Asociación de Energías Renovables de Andalucía) Maintenance providers of energy systems (e.g. APADGE Asociación Profesional Andaluza de Gestores Energéticos, FADIA (Federación de Asociaciones de Instaladores de Andalucía) Electric vehicle related businesses (e.g. AEDIVE (Asociación Empresarial para el Desarrollo e Impulso del Vehículo Eléctrico, APEIBAL Asociación Empresarial de Pilas, Baterías y Almacenamiento Energético) ICT providers (e.g. ETICOM Asociación de Empresarios de las Tecnologías de la Información y la Comunicación de Andalucía), Clusters (e.g. Cluster Andalucía Smart City) Research and development entities (e.g. CTA Corporación Tecnológica de Andalucía, ALINNE Alianza por la Investigación y la Innovación Energéticas) Professional associations (e.g. ATEAN la Asociación de Técnicos en Energía de Andalucía) | Departments of the regional government (e.g. Consejería de Economía - Dirección General de Economía Digital e Innovación, Consejería de Hacienda industria y Energía) Agencies of the regional government (e.g. Agencia Andaluza de la Energía, Agencia IDEA) Local governments (e.g. FAMP Federación Andaluza de Municipios y Provincias) Spanish central government (e.g. Ministry of Industry and Ministry of Ecological Transition) "Universities" "vocational skills providers (e.g. ...)" Spanish central government agencies (e.g. CDTI Centro para el Desarrollo Tecnológico Industrial, CIEMAT Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas, EOI (Escuela de Organización industrial and Red Eléctrica de España) Universities (e.g. Pablo de Olavide) |

ENVISIONING THE TRANSITION IN THE REGION

The Andalusian Innovation Strategy 2020

- R&D spending to 2.2% of GDP, private sector investment in innovation to 50%

Selected RIS3 Strategy priorities

- Promotion of Renewable Energies; Transport and logistics; Advanced Transport Systems and advance manufacturing; Digital Economy

The Andalusian Sustainable Development Strategy 2030 (EADS 2030)

- Urban sustainability associated with smart-sustainable energy, mobility and transport.

EUROPEAN AND NATIONAL TARGETS FOR ENERGY AND TRANSPORT TRANSITION

EU Green Deal and draft law of "Climate Change and Energy Transition"

- Become climate-neutral by 2050
- 35% of renewables in final energy consumption
- 70% of renewables in electricity generation
- By 2040 vehicles should emit zero grams of CO per kilometer

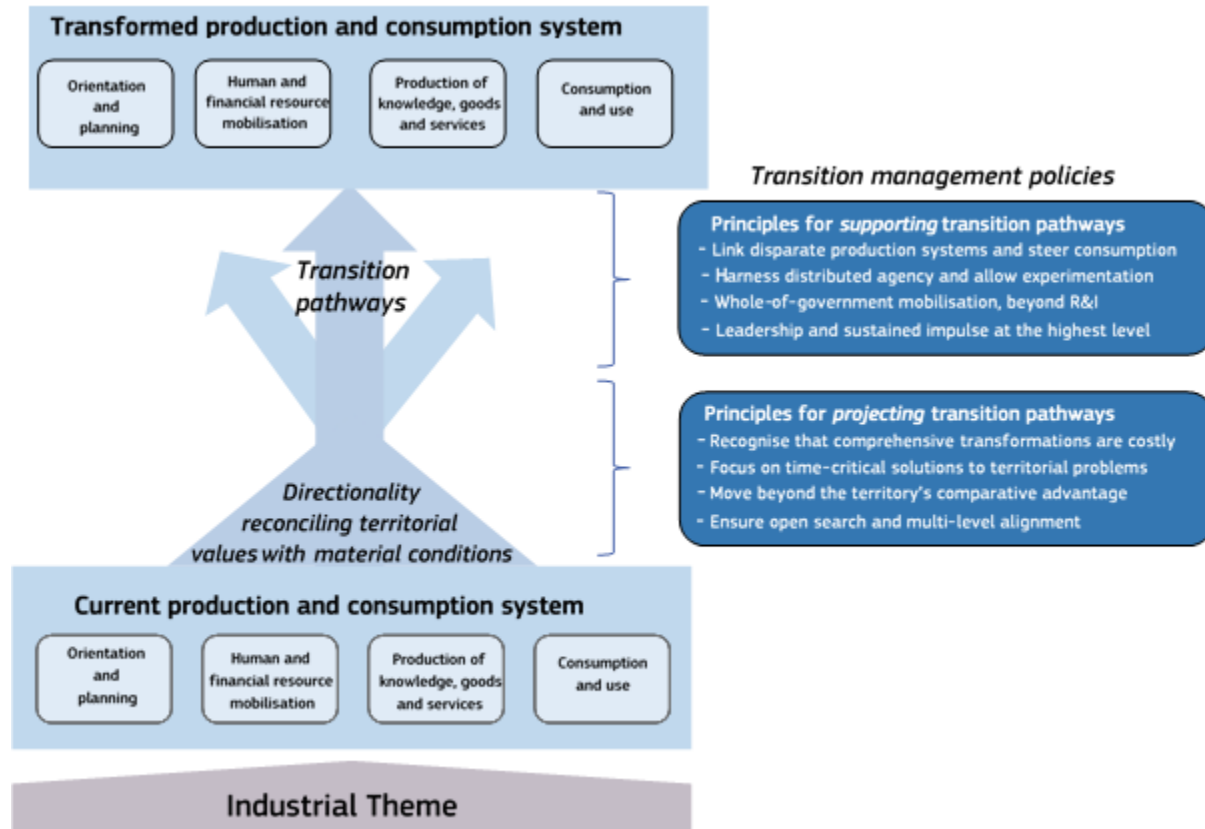
Spain 2050 Draft of the law of "Climate Change and Energy Transition)

- 90% reduction of GHG
- 100% of electricity generation from renewables

Integrated Plan for Energy and Climate (PNIEC) by 2030

- 21% reduction of GHG vs. 1990 to be achieved
- 42% of renewables in final energy
- 74% of renewables in electricity generation
- 39.6% improvement in energy efficiency

A UNIQUE WINDOW OF OPPORTUNITY: THE SUSTAINABILITY TRANSITION



Renewable energy and electrification of mobility create many opportunities for industrial development and employment creation

Required: clear sense of purpose, adequate preparation and broad stakeholder mobilization

In partnership with the Junta de Andalucía, **a review of industrial transition** following a JRC methodology commenced in October

Seeks paths for broad-based employment creation: *knowledge-intensive, environmentally sustainable and socially responsible.*

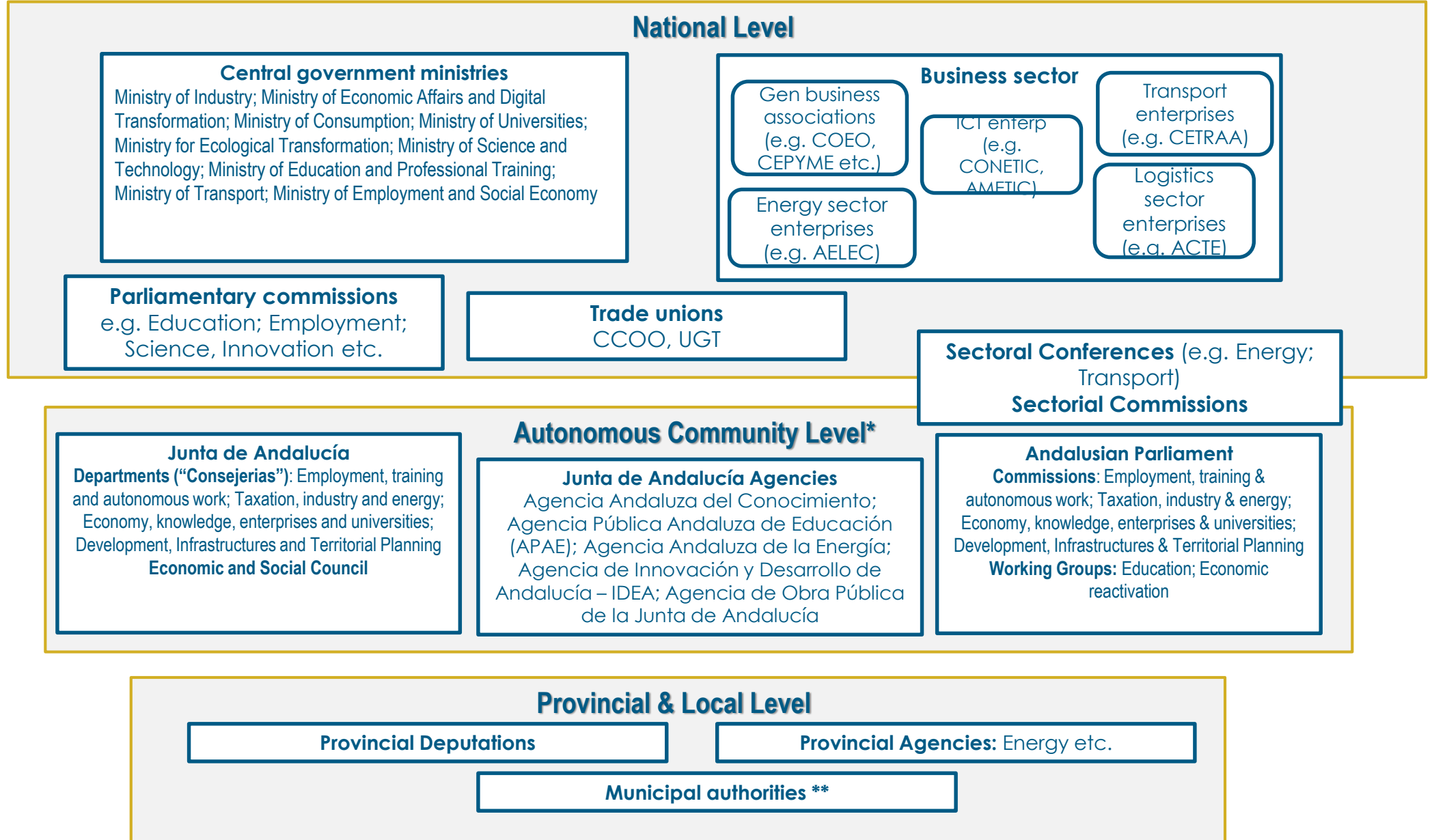
Orientation and Coordination

***Exclusive autonomous competences:**
Industry, commerce

Shared role with central government:
environment, economic policy, consumer protection

Role in implementation:
employment and vocational education

****Local competences:**
traffic planning
urban planning
road paving
environmental protection
consumer protection
water supply and public lighting
public transport



ORIENTATION AND PLANNING

| Strengths of Orientation & Planning | Weaknesses of Orientation & Planning |
|--|---|
| <p>Strong actors involved and committed to energy transition (e.g. public actors, clusters) with guiding regional and national framework</p> <p>Fair degree of coherence between the different levels of frameworks</p> <p>Strong national plan for energy and climate</p> | <p>Lack of a driving company – catalyser & regional champion.</p> <p>Lack of ambitious local business partnerships</p> |
| <p>Develop policy actions that can catalyse the transitions</p> <p>Develop a vision of inclusive and sustainable development</p> <p>Clusters to act as a local test-bed</p> <p>Regulatory sandboxes for minigrids and e-mobility pilots</p> <p>Create partnerships around a coherent industrial logic</p> <p>Empower cities to play a greater role on the local development of energy and mobility solutions.</p> <p>Produce sustainable energy for export</p> | <p>Inertia and path dependency effects</p> <p>Challenge of coordinating all actors around a coherent industrial development logic</p> |
| Opportunities of Orientation & Planning | Threats of Orientation & Planning |

RESOURCES MOBILIZATION

| Strengths of Resources mobilization | Weaknesses of Resources mobilization |
|---|---|
| <p>Natural renewable resources</p> <p>Strong network of public actors with high capacity for public procurement</p> <p>Leadership in the transition</p> <p>Experience in European projects and fundings</p> <p>High quality tertiary graduates in renewables / supply chain</p> | <p>Deficit of local financial investors and assets (banks, venture capital, etc)</p> <p>Barriers to private investment: regulation, rule of law, cost of capital</p> <p>Part of the population with weak or out of date vocational skills</p> <p>Lack of large-scale pilots</p> <p>Inertia due to current carbon-based electricity and mobility/transport</p> |
| <p>Attraction of national or international investments</p> <p>Rethink financing models by tapping into participatory, local finance (crowdlending)</p> <p>Create a resilient and diverse financial system</p> <p>Public procurement on innovations</p> | <p>Slowness of funding by project logic, i.e. delay for innovation development and scale up</p> <p>Dependence on European Union funding schemes and need to diversify portfolios of resources</p> <p>Brain drain of top talents</p> |
| Opportunities of Resources mobilization | Threats of Resources mobilization |

PRODUCTION

| Strengths of Production | Weaknesses of Production |
|---|---|
| <p>University and R&D base</p> <p>Strong R&I niches, e.g. thermal solar energy</p> <p>Highly innovative companies, with a broad portfolio (hydrogen, photovoltaic...)</p> <p>Diverse ecosystem of players</p> <p>Electricity distribution companies active in piloting smart solutions</p> | <p>NEETS; labor-education mismatches (notably, lack of technical labor)</p> <p>Lack of leading-edge Hi-Tech competencies and of global industry leader(s)</p> <p>High production costs (thermal solar, batteries)</p> <p>Regulation: obstacles to innovation on energy distribution, smart microgrids</p> |
| <p>Update and upgrade skills to create a pool of labor for the transition</p> <p>Multi-stakeholder, cross sectoral collaborations</p> <p>Hybrid energy mix solution more resilient to climate, environmental and economic crises</p> <p>Electric mobility with renewables</p> <p>Smart and distributed grids, Intelligent energy storage, Future city concept</p> | <p>Talent loss to more attractive countries or regions</p> <p>Economic exclusion & employment decline</p> <p>Loss of competitiveness on certain subsectors, e.g. batteries vs China</p> <p>High added-value activities captured in the by foreign dominated value chains</p> |
| Opportunities of Production | Threats of Production |

CONSUMPTION AND USES

| Strengths of Consumption and Uses | Weaknesses of Consumption and Uses |
|--|---|
| <p>Incipient EV charging network and a community of early adopters Mobilization of association of transportation actors (ANFAC)</p> <p>Household consumption of renewable energy</p> <p>Consumer initiatives</p> <p>E-mobility in cities</p> <p>Existence of incentives and regulatory framework for the renewal of the park (MOVES)</p> | <p>Relatively low buying power</p> <p>Relatively low involvement and representation of civil society despite the existence of active grassroots movement</p> <p>Lack of familiarity with microgrids and e-mobility</p> <p>Acculturation in carbon-based consumption patterns High private vehicle ownership and old age of the stock which might lead to a slow renewal of the park</p> |
| <p>High private vehicle ownership</p> <p>Transform cities and relations to territories</p> <p>Implement participatory governance models of transition to co-construct transition</p> <p>Democratize photovoltaic</p> | <p>Geographical exclusion, i.e. territorial gaps or forgotten territories / social exclusion with winners and losers</p> <p>Lack of social accountability</p> <p>Inertia and path dependency effects Poverty trap to inferior solutions driven by costs rather than quality or sustainability</p> |
| Opportunities of Consumption and Uses | Threats of Consumption and Uses |

SYNTHESIS OF PRELIMINARY FINDINGS FROM THE REVIEW

- Andalusia is well positioned to benefit from the transition towards sustainable energy and transport: **effective government, strong university and R&D base, dynamic small companies in batteries, smart grids, solar photovoltaic, thermal solar and even hydrogen.**
- **However: no longer benefits from a regional industrial champion ('empresa tractor').** Andalusian businesses can help fill this gap if they can develop **joint agendas for action.** Role for additional national and international investment.
- Opportunities for employment creation by foreseeable tendencies towards **consumer/household expenditures in renewables electric mobility** and the **sharing economy.**
- Review examines scope for actions in public procurement, skills development, **demonstrator projects, infrastructure investment** and **community-driven entrepreneurship.**

KEY CHARACTERISTICS OF THE TRANSITION

| | Key characteristics | Key stakeholders for transition | Key objectives |
|--|---|--|---|
| Orientation | <p>Commitment to transition</p> <p>Strategic planning already ongoing with guiding regional, national and transnational frameworks</p> | <p>Junta – RIS3, Energy Agency, IDEA</p> <p>Provinces, city halls</p> <p>Clusters, e.g. Cartuja, Andalucian Smart City</p> | <p>Shared vision and commitment of key players across society.</p> |
| Resource mobilisation | <p>Disconnected initiatives and resource mobilisation strategies</p> <p>Opportunity for a business leader</p> | <p>IDEA and other public agencies</p> <p>Endesa</p> <p>Iberdrola</p> | <p>Vibrant internationally connected ecosystem with industrial and R&I leaders</p> |
| Production (knowledge, goods, services) | <p>University and R&D base</p> <p>Strong R&I niches, e.g. thermal solar energy</p> <p>Highly innovative companies, with a broad portfolio (hydrogen, photovoltaic...)</p> <p>Diverse ecosystem of players</p> <p>Need to update and upgrade skills to create a pool of labor for the transitionPool</p> | <p>Generation Cepsa, Endesa, Iberdrola</p> <p>Grids and distribution, Endesa (Cartuja), Red electrica</p> <p>Manufacturing : EV startup, Batteries in Granada, Chinese, EV buses with Chinese</p> <p>Mobility charging, Endesa, Abengoa</p> <p>Vocational skills stakeholders: Observatorio del IACP</p> | <p>Andalusian companies and R&I partnerships have obtained global leadership in:</p> <ul style="list-style-type: none"> -distributed intelligent renewable energy systems to produce, store and distribute electricity; -electric vehicles including its key components, in particular batteries. -Infrastructure for charging and maintenance of electric vehicles. -Logistics on inland, sea and air. -ICT as transversal technologies serving to connect energy, batteries and logistics. |
| Consumption (intermediate, final) | <p>E-mobility in development in cities</p> <p>Innovative initiatives on buses</p> <p>Incipient EV charging network and a community of early adopters</p> <p>Household consumption of renewable energy</p> <p>Consumer initiatives</p> | <p>Ayuntamientos</p> <p>NGOs</p> <p>Microgrid projects</p> <p>Cooperatives (Zencer, Som Energia...)</p> <p>Green Bus projects (Paloma, Victoria...)</p> <p>EMT (Empresa Malagueña de Transportes)</p> <p>Mobility sharing (Muving, Acciona)</p> | <p>The Andalusian are well informed proactive consumers maintaining and utilising numerous minigrids and electric mobility and exercising conscious consumerism ensuring demand for low carbon businesses.</p> |

POTENTIAL RECOMMENDATIONS

- Science, Technology, Innovation framing : centered on **transformative change**, on **experimentations** and on **deliberative governance processes** (Schot & Steinmueller, 2018).
- Key Orientation & Planning stakeholders as agents of **transformative change** (Junta, Energy Agency, etc) especially through public procurement
- Accompanying **old professions towards transition** (e.g. vehicle maintenance) to avoid **resistance to change: importance of vocational training / innovation capabilities**
- Develop clusters as loci of **experimentations**, with a need to facilitate experimentations through regulatory sandboxes, for instance for Hydrogen (e.g. **pilot projects**)
- Drawing on community-driven entrepreneurship, including for financing (through local **crowdlending** initiatives, e.g. creating a transition crowdlending platform)
- Develop support coalitions to foster **deliberative governance in a whole-of-government mobilization**
- Next steps of the review: synthesise actions to catalyse the transition, including the identification of a broadly inclusive vision for the nexus of energy and logistics, the development of ambitious local business partnerships, and the potential of follow-up actions to simultaneously address linked challenges such as international competitiveness, social exclusion and poverty, low levels of entrepreneurship, and low levels of social accountability.

