

Supplementary Material 3. Characteristics of studies included in the systematic review.

Publication	Intervention (CSC for SLD)	Study population	Study design	Primary outcomes
Marín-González et al. [16]	Knowledge exchange network	Theoretical documents	Abductive method	Development of a knowledge exchange network is vital for SLD.
			Deductive inference technique	Knowledge networks for local sustainability have positive effects within the alliances and links between the sectors that make up a society. Social actors' consensus leads to the strengthening of governance.
			Content analysis	
			Documentary design	Social capital connects subjects with common objectives.
Moallemi et al. [18]	Transdisciplinary innovation/agenda	SDGs	Systematic analysis	Active role of local stakeholders for sustainability was being promoted since 1980s; the earliest and widely known is LA21.
		Recent trends in the literature	Critical analysis	<p>Institutions, policies and strategic partnerships (between academic and non-academic) are important to incorporate and operationalise local sustainability.</p> <p>Formulation of sustainability goals/indicators at higher level (global) are less sensitive, unclear or insignificant at the local level, thus, has led to lack of genuine participation, limited buy-in and involvement from the local community.</p> <p>Bottom-up approach, community needs analysis and visioning and round table discussions are required to address competing economic, social and environmental priorities among diverse stakeholders within local and between local regions and between local and national/global players.</p> <p>Collectively framing local sustainability goals and actions, evaluating critical uncertainties and co-creating adaptive plans are important to localise SDGs.</p>

				Modelling can support/complement stakeholder engagement to operationalise local sustainability.
Armstrong & Stratford [54]	Community-based network/partnership	Community members, local and state governments and Forestry Tasmania of Geeveston Streetscape Reference Group (GSRG) in Huon Valley, Tasmania. Australia.	Empirical data generated over the period from 1999 to 2003 In-depth interviews	Local participatory governance processes are fundamental to developing sustainable communities. Participation provided opportunities for civic and institutional capacity building and worked to rebuild trust between citizens and the local government. Areas of concern: (1) the articulation of the extent of open, flatten and radicalised government systems and governance, and (2) mechanism for more civic and ecologically literate actors to create novel alliances and networks that fulfil the potential of partnerships. Governance, participation, internalisation and acceptance of the need for change among local governments and communities influence the sustainability practices.
Battaglia et al. [55]	Profile for a new territorial planning model of local sustainable development (based on multi-disciplinary and multi-stakeholder processes)	Northern Italian inner area (Valle Camonica)	Collaborative Action Research between University X (experts in sustainability management, local sustainable development and stakeholder engagement processes) and University Y (experts in landscape and natural protected areas planning)	A sustainable development plan (15-20 years horizon) between local authorities and communities was developed. The plan consists of 19 goals and 49 strategic actions that require stakeholders' involvement. The support of actors with detailed context knowledge represents a strategic collaboration that ensures the success of a plan. The proposed model, which integrates technical analysis as well as involvement of experts and local stakeholders, can be used to pursue long-term place-based or inner-area development.

			Between January 2014-January 2015.	
Blake [56]	Community-university partnership (sustainable communities project)	University of Plymouth, UK (student community development project – 2007-2008) 4 community agency supervisors and 13 students	Case study Semi-structured interviews Workshops	Students were able to develop a multidimensional understanding of sustainability, and thus, able to become change agents for local sustainability. Top-level support from the leader is vital for local sustainability programme. Student learning characteristics and workshop participants' experience, values and understanding are important determinants in embracing partnership for sustainability. Workshops conducted established co-learning partnerships between students, community agencies and university staff.
Borgström [57]	Multi-level governance (MLG) model	26 municipalities in Stockholm county in Sweden. Consultants, civil servants at regional authorities, and representatives from adult education and local initiative networks.	Case study Semi-structured interviews Focus group discussions Workshops	Local sustainability initiatives (LSIs) work locally within one municipality and is often connected to a local network of actors. LSI being linked with a larger and well-known organisation, such as well-established NGO has a larger impact. Political support in terms of finance, space, sustainability knowledge, and promotion are essential for LSIs. A lot of resources are wasted in short-term projects without clear strategy for how to bring the knowledge further (waste of financial and social capital). LSIs are highly dependent on personal engagement, willingness (volunteerism) and courage to explore new approaches. Lack of time for networking and sustainability translators who can facilitate communication with municipalities. Decentralised national system resulted in diversified MLG structures. However, disconnection between actors, levels and sectors and the short-term funding structure impose challenges.

Burmaa & Baasanjav [58]	Integrated Community Development Partnership (ICDP)	100 citizens and circa 40 mining companies from Selenge,Uvs, Bayankhongor, Uvurkhangai provinces in Mongolia	Interviews Questionnaires (between 2015 and 2020)	<p>Integrated policy, good institutional capacity, cooperation, communication, partnership, size of the region, population, state structure and organisation, peculiarities of governance, socioeconomic conditions, mutual understanding and trust are the key factors. The most important goals of the partnership is to find the intersection of common interests of the stakeholders.</p> <p>There is weak understanding of partnership-related local community development among stakeholders; weak collaboration between state and local administrations, and low capacity of public sector human resources at the local administrative level.</p>
Cannarella & Piccioni [59]	Territorial networks	A village with 4000 inhabitants in the province of Viterbo, Italy.	Critical contributions from complex network theories, empirical observations and models implementation carried out within the research project between the research team of the Institute of Chemical Methods and the Vitorchiano Municipality.	<p>Territorial network should include context, agents, goals, inputs, actions, results, products and impacts parameters.</p> <p>A territorial network building should be based on cooperation that is linked to a deep understanding of agents' profiles, needs and characteristics connected to a given context defined as already existing mentalities, behaviours, attitudes, approaches and practices in a consolidated environment (Cannarella and Piccioni, 2008, p.224).</p> <p>Capacity building, cooperation and trust are important for collaboration to occur in territorial networks.</p>
Cottafava & Corazza [60]	Local sustainability stakeholders ecosystem	160 citizens the City of Turin and 40 relevant stakeholders (NGOs, local Public Administrations, university)	Case study Participatory community network mapping	<p>Methodology consists of two main mapping processes: (1) sustainability topics network and (2) stakeholders' network.</p> <p>Betweenness centrality is the best indicator to assess the importance of a stakeholder within a whole network and eigenvector centrality shows the quality of the already engaged stakeholders of an organisation. The closeness centrality of a small network is not appropriate to assess the centrality of a stakeholder.</p>

		students, and energy providers of Turin, Italy.		
Darlow & Newby [61]	Environment City partnership project	Leicester, UK	Critical appraisal	<p>Environmental action requires public, private and political support.</p> <p>For partnerships to work, commitment, motivation, organic structures, resources, time and right set of people and circumstances are needed.</p> <p>Partnership should look into stimulating actions within businesses; encourage community participation and address peer pressures, values and image.</p>
Devenin [62]	Collaborative community development model	<p>Calama Plus and Creo Antofagasta public-private programs in mining region of northern Chile, South America.</p> <p>21 companies and 2 universities</p>	Case study Interviews	<p>Collaborative community model developed based on collaborative governance framework.</p> <p>Differentiating features of collaborative community should be identified in terms of relationship focus, partnership bases and governance, interaction with community, bonding and time frame.</p> <p>Reasons for companies to participate: development agent recognition, need not reinvent the wheel, management of community expectations and synergies between different participants.</p> <p>Differentiated contribution of each company: financial and human resources, assessments, training, supply of infrastructure; contribution to the total or part of the project; based on series of criteria of a project (i.e. type, level, stakeholder group).</p> <p>Problems identified include time management, and credibility maintenance with long-term projects.</p> <p>Impact assessment of this model should be carried out in the future to assess its effects on society, economy and environment.</p>

Dzhengiz [63]	Sustainable alliance portfolio configurations	16 utility companies in the electricity industry of Great Britain Members of sustainable alliance which consists of Business, NGOs, research centres, government, council and communities	Exploratory case studies	<p>Half of the organisations studied, communicated that they interpret sustainability issues with a business case frame, four based on social frame, one with an environmental frame and three with paradoxical frame.</p> <p>Cognitive homophily (perceived similarities of organisational values that guide sustainability interpretations) is a common factor among respondents in selecting partners to tackle sustainability issues.</p> <p>Companies with social frame most frequently collaborate with government and community organisations, while utilities with business frame often collaborate with cognitively similar organisations that look out for branding and reputation, cost and risk reduction, value creation, profitability sources.</p>
Gebre-Egziabher [64]	Sustainable cities programme (SCP)	Partners in more than 40 cities in 26 countries (Latin America, Caribbean, Europe, Africa, Asia) for cross-sectoral and participatory environmental planning and management (EPM)	Not stated	<p>Principal achievements of SCP: systematic documentation process at the local level based on stakeholder monitoring and local self-evaluation systems; application of handbooks and toolkits to strengthen (EPM) processes; use of catalytic funds to establish meetings and dialogue sessions; development of knowledge management and outreach information service.</p> <p>EPM principles can be achieved by SCP through operational process, which include the identification of interested stakeholders, information and expertise, city environmental profile, setting priorities, mobilisation of resources, etc.</p>
Hafteck [65]	Decentralised cooperation (Vertical collaboration)	Donor countries to development aid and local government associations	<p>Exploratory study</p> <p>Conceptual mapping</p>	Points of convergence between local and regional governments involve the lead actors (local government), an overarching objective for sustainable local development, and the exchanges and support of activities carried out.

Hands & Anderson [66]	UN SDGs engagement	Staff and students at Kingston University, UK	Background analysis and literature review of the use of sustainable development indicators and local sustainability initiatives (SIs) in the higher education (HE) sector. Semi-structured interviews (August to September 2016)	Challenges to engage the implementation of UN SDGs within HE sector is the lack of knowledge of their existence and a sense of inertia amongst professionals. The relevance of UN SDGs to the university must be made clear by translating and explaining their link to the daily operations of the university, staff and students. Greater engagement with staff and students is essential to create awareness, social responsibility and enable participation. There is a need to consider the influence of social norms and social pressures in encouraging engagement and communication concerning UN SDGs.
Hawkins & Wang [67]	Sustainable development governance for local collaboration	Local managers of U.S. cities with 50,000 or more in population	Mail and web-based survey	Local organisations (i.e. chambers of commerce, non-profits and neighbourhood-based) represent local support network to develop city policy. Citizen participation had direct impact on local sustainability efforts. Citizens used information provision activities, boards, commissions, workshops and surveys through collaborative planning and implementation. Cities with greater democratic votes from residents were progressive in environmental governance. Cities with higher levels of poverty sought out for support from organisations that are less costly, such as universities. Local context (education, income, etc.) is closely linked to how communities adjust to the possible conflicts between environmental, economic and social goals.

Hawkins et al. [68]	Collaborative networks (informal, voluntary and self-organising)	Integrated city sustainability database (ICSD) U.S. cities with 50,000 or more in population	Survey	Administrative capacity and community stakeholder support have positive impact on increasing the diversity of the types of network partners. Cities with greater capacity and more interest group support engage a larger number of partners. Collaboration entails transaction costs as well as risks associated with collective action problems.
Ioppolo et al. [69]	Public and private environmental governance (EG)	40 municipalities, three provinces of Nebrodi, Italy and Environmental National Park 143,763 inhabitants	Case study With the support of consultants and experts from academia, a shared Strategic Plan (SP) for the Nebrodi region was developed and promoted	Shared SP allowed EG with a long life operative capacity. SP ensures continuity and administrative progress to the decisions made by the local authorities. Allows democratic and participatory approach via deliberative dialogues (SP Forum). Management capacity is essential.
Kusakabe [70]	Machizukuri (community planning)	Takashima, Yasu and Kyoto cities in Japan	Interviews Surveys Document analysis Regression analysis	Social capital accumulation, types of governance and networks available in communities influence the level of sustainability achievement (LA 21). Local government should create an environment that empowers citizens to collaboratively make rules for participation, identify key network members and develop sustainability strategies. Bracing social capital networks that link bonding/bridging capital across sectors and levels needs to be measured. Size of city influences social capital networks.

Leal Filho et al. [71]	Higher education sector engagement in local sustainability initiatives	22 universities from industrialised and developing countries; most are public universities	International qualitative survey Networking Case studies	<p>Universities should pursue partnerships and joint initiatives, understand local communities' needs and make their know-how more widely available</p> <p>More than 80% of universities rated their local networks positively.</p> <p>Challenges include lack of resources/incentives and coordination, time constraint, disciplinary silos, lack of interest among colleagues, social partners and municipalities.</p> <p>Leadership plays a crucial role in deciding sustainability priorities of a university.</p> <p>Successful implementation requires both top-down and bottom-up approaches for cooperation between universities and local community.</p>
Liao et al. [72]	Cross agency collaboration	1899 cities and counties across U.S. from the International City and County Association (ICMA)	<p>2015 Local Government Sustainability Practices Survey</p> <p>Data from U.S. Census of Population and Housing (2010), American Community Survey (2010-2014 averages) and 2012 Census of Government finance Regression analysis</p>	<p>Only 26% of local government reports prioritised social equity.</p> <p>Municipalities that engage in more social equity policy have formal citizen engagement, ownership of utilities, and pressure from local businesses.</p> <p>Local sustainability should include multi-sectoral and collaborative problem-solving.</p> <p>Distributive and procedural justice are important in SLD.</p> <p>Governance that incorporates public, business and cross-sectoral government agencies helps localities to pursue a balanced SLD.</p>

Meessen et al.[73]	The Forum Process & Seed Money Actions (SMAs)	3 Large Protected Areas (LPAs) of Slovak mountains	Action and transdisciplinary research Case study	<p>Main achievements: diverse stakeholders (state, local, private institutions and individuals for the first time entered negotiations focusing on common regional development; SMAs are fruitful form of cooperation between protected area managers and local inhabitants; Slovak Nature Conservancy (SNC) has become more open to participation to balance nature conservation and local benefits.</p> <p>Main challenges encountered: disagreement between local and national stakeholders in bringing together LPAs conservation, sustainable benefits and better living conditions for local populations; power relations between national ministries and the State Nature Conservancy (SNC); differences between LPAs and their surrounding municipalities (e.g. geographic location, economic wealth status); decisions on who identify and invite relevant stakeholders.</p> <p>Stakeholder analysis presents different categories of stakeholders, their focus on nature conservation, local development of LPA region and income generation, main perspectives and comments.</p>
Mosier [74]	Town-gown relations (university-community engagement)	Two top-50 ranked cities on the Opp-Saunders Sustainability Practices Index (OSSPI) in the US: San Antonio, Texas and Dubuque, Iowa.	Comparative case study	<p>Larger public universities tend to have stronger relationships and effects on local sustainability efforts.</p> <p>UTSA and Alamo Colleges showed the strongest environmental town-gown relationships with San Antonio. Examples of engagement include participation in the development of Mission Verde (city's overarching sustainability plan), service learning, applied research, faculty involvement, student volunteerism and green training courses.</p> <p>Compared to San Antonio, Dubuque has not fostered strong relationships with local colleges and universities. Different attributes of each city, such as size influence the sustainability relationships.</p>

				<p>While in San Antonio, there appears to be synergy between the city, universities and community partners; in Dubuque there is an absence of meaningful engagement due to dissenting opinions about the direction of sustainability policy, both inside and outside of the city government.</p> <p>Variables that are more difficult to assess within the cases, but may lead to stronger levels of engagement with communities include institutionalisation of sustainability, community college impact, status as a religious or land-grant institute and urbanisation.</p>
Nevens et al. [75]	Urban transition labs (UTL)	Five European cities of EU MUSIC project (Aberdeen, Gent, Rotterdam, Montreuil and Ludwigsburg)	<p>‘Transition-team’ co-designs the process and provides relevant information to the city transition ‘arenas’ (the actual initial change incubators crewed by local frontrunners who are engaged visionaries with different backgrounds.</p> <p>The findings of arenas lead to further participatory process of relevant stakeholders into action.</p>	<p>First UTL experiences demonstrated the prospects for systems thinking, drastic innovations, new city governance, diffusing actor engagement and long-term considerations.</p> <p>Facilitates ‘learning by doing.’</p>

Peng [76]	Collaborative place-making	Meinung in Taiwan with population around 42,000 Fifteen key actors who played a major role in relation to the anti-dam campaign	Case study Fieldwork (unstructured interviews and questionnaires in January and May 2011) Social network analysis (377 chronological activities in databases from 1992 to 2010) Survey for public perceptions (May to July 2011)	Informal network among organisations affects the anti-dam campaign and organisational relationships for improved institutional capacity. Activities such as dialogue, parade, convergence and pleading reflect the ideas of local empowerment. Institutional capacity building relates to local sustainability. Improvement of relational resources and close relationships between intellectuals, residents of different generations, local, native and outside people are necessary for better place-making. Institutional setting, relationships between actors and common goals distant from public perception are important viewpoints of governance.
Pinch & Reimer [77]	Sustainable commodity network	British wartime Utility furniture scheme	Archival research Case study	Utility scheme implementation focuses on the need to eliminate waste to manage the use/consumption of scarce natural resources. National states must carefully manage scarce natural resources and should act as important organizing agents for sustainable and equitable environmental practice. Sustainability can be best achieved through interventions across a commodity network. Utility's pragmatic centralism involves a cross-sector response with multiple participants organised by state at a national level but also working through localised routines and procedures.

Quest et al.[78]	Sustainable food city partnership	Bournemouth University (BU), UK	Case study Survey	Stakeholder collaboration via a variety of research initiatives has facilitated development of a sustainable food city partnership that is aimed at achieving a more sustainable food system transition.
		Manager, local authorities and members of Bournemouth and Poole Sustainable Food City Partnership (BPSFCP)	Paired discussions Pictorial outputs Workshop	<p>Collaboration has led the partnership to ensure sustainability and continuity after the initial funding phase.</p> <p>Capacity building in the community entails relationship building and knowledge sharing with other community stakeholders.</p> <p>University members have helped to inform strategic direction, vision, mission, aims and values for the partnership.</p> <p>“Seismic shift” is required to change attitudes and behaviours, and wider public education is needed on local food production and sourcing, healthy eating, cooking and food waste.</p> <p>Requires substantial goodwill and time, and imposes human and financial resource constraints.</p> <p>Bournemouth council has yet to align all of its practices with the goal of sustainability, creating events of internal conflict.</p> <p>The partnership has been proactively attempting for a regime change rather than embracing a supporting role.</p> <p>An individual “champion” or “ambassador” who holds a key position with clear understanding of sustainable development and sustainable food can improve the traction within councils.</p>
Reeves et al.[79]	Local Green Groups (LGGs)	Leicester, UK Leicestershire and Rutland sub-region	Action research Case study	Ongoing involvement of volunteers is required for the activities of LGG to sustain.

		(population of 1.3m)		<p>Community development strategies driven by an external agency can establish new LGGs.</p> <p>Key challenges: - Mobilisation, where most expressed concern and frustration that more people did not wish to get involved, and recruiting an active membership and the limited capacity of volunteer to plan and deliver projects and events.</p> <p>By the end of the project, only three out of six groups still active (rural county, rural district and small village).</p> <p>A point of contact to assist the development of new projects and activities is essential.</p>
Selman & Wragg [80]	Biodiversity Link Group	Large and small organisations in Oxfordshire, UK	<p>Interviews</p> <p>Document analysis</p> <p>Participant observation at meetings</p>	<p>Traditional green groups feel their efforts are being dissipated or submerged.</p> <p>Excessive inclusivity lead to vague purpose, direction and commitment.</p> <p>Challenges include competition for funding, external communication of policy stances and unproven scientific assumptions.</p>
Sobol [81]	Sustainable communities	138 respondents in the cities in Poland (Kraków, Katowice and Racibórz)	Survey	<p>Governance is prerequisite for local sustainable development.</p> <p>Little opportunities given for collective action and limited access to local development process.</p> <p>Partnership and dialogues between local community and government is critical for sustainable development.</p> <p>There is lack of transparency, participatory procedures, and willingness to cooperate in the cities of Poland. Inactivity and inertia in public affairs are also typical in Polish society.</p>

Stepankova & Kristianova [82]	Top-down strategies and bottom-up initiatives	Geopark programs in Slovakia	Examination of geopark creation processes – the preparatory phase, realisation phase and running phase	Top-down strategies (coordination, administration, expertise and execution) from state government are important in the establishment phase of geoparks. Bottom-up initiatives and collaboration/partnerships between regional, local governments, civic organisations and entrepreneurs are critical for successful geopark existence and management.
Stojanovic & Barker [83]	Coastal partnership	Local coastal partnerships in the UK	Synthesis of results from a wide range of empirical research	<p>Failure of coastal partnership due to internal constraints such as inefficiency and inefficacy, legitimacy, ineffectiveness, increased bureaucracy and implementation failure. External constraints include partnerships are not backed up (lack of sustainable financing and training) by a dedicated national programme.</p> <p>Consideration on bottom-up approach community-based actions that empower resource users to take part in managing the local sustainability at the coasts and develop their own schemes.</p>
Swann [84]	Cross-sector collaboration	Tallahassee, US Neighborhood Energy Challenge (TNEC) in 2009 Four cities of Tallahassee employees, president of Council of Neighborhood Associations (CONA)	Case study Focus group (2015-2016) In-depth key informant interview	<p>Bottom-up sustainability innovation through cross-sector collaboration, led by policy entrepreneurs can implement a successful energy competition.</p> <p>Collaborations that are initiated by entrepreneurs tend to fail due to organisational inertia, time constraint, lack of skills to adapt to changing circumstances.</p> <p>Outlining governmental and non-governmental tasks and boundaries was more complicated.</p> <p>One of the most challenging and least understood aspects of the cross-sector collaboration is to motivate citizen participants to get involved.</p> <p>Besides intrinsic benefits (i.e. thrill of competing), extrinsic rewards (i.e. monetary prize or a champion ring) are important for competitions.</p>
Törnå et al.[85]	Nature Town Project	Swedish Local Planning	Document analysis Workshops	The initially set sustainability goals go through a reinterpretation process during the dialogue process, where the LPA sets the rules and

		Authorities (LPA) representatives	Interviews	<p>selects the criteria that sets forth the basis for the building actors in designing their solutions.</p> <p>The description of process through a coordination mechanism perspective reveals that mutual adjustment is used together with more formal standardisation of the outcome and work process.</p> <p>The way LPA interacts with building actors involves social interdependency throughout the entire process, thus if managed properly may lead to greater sustainability goal achievement.</p>
Trott et al. [86]	Youth-led collaborative sustainability action	Participants are children between the ages of 8-14 from Western US and Southern Haiti.	International case studies Participatory action research (PAR)/photovoice	<p>Application of art-science integration enable participants' learning, connection and action for sustainability within local contexts.</p> <p>Case studies offer action-oriented methodological framework that combines top-down and bottom-up approaches. Begins with transdisciplinary learning to acquire knowledge.</p> <p>Case studies demonstrate differences in terms of sustainability challenges they pursued to address, the specific context in which activities occurred, and the way art-science integration was practiced.</p>
Voisey et al. [87]	Local sustainability based on LA21	UK, Germany and Norway Experiences emerging from local government as a major stakeholder in Agenda 21	Case studies	<p>Local authorities of the three countries are yet to respond to global environmental considerations or undertake sustainable development at local level.</p> <p>Domestic barriers as relative power of local authorities, financial and resources constraints, lack of a central coordination framework, political will and information hamper the progress of local SD. However, the UK example showed lack of power can encourage action towards greater local self-determination and LA21.</p> <p>Most important aspect of LA21 implementation in any country is support through networks of local government, domestic and international, partnerships with other local actors, policy and financial</p>

				support from central government, and local commitment through public participation.
Wallner & Narodoslowsky [88]	Sustainable islands	Network paradigm	Conceptual review	<p>Based on bottom-up approach that aims to create certain networking activities at the regional level.</p> <p>Basic assumption of 'Islands of Sustainability' is that sustainable development can be introduced from small sustainable regions.</p> <p>Key aspects to create regional sustainability include communication activities and persons within the regional network and with the environment.</p> <p>Structural aspects of the anthropogenic system are strongly related to long-term sustainability and resilience of the regional economic system and sustainability.</p> <p>Associations between cleaner productions, industrial ecology and island approaches that are based on Network Paradigm will lead to sustainability.</p>
Zanon [89]	Spatial planning	Northern Italy	Case study Document analysis	<p>Territorial cohesion requires economic restructuring and reorganisation of urban networks at the wider level.</p> <p>The shift from land-use-based planning documents to more strategic plans in the Italian planning system indicates new relationships among institutions and between the public and private sectors.</p> <p>In terms of learning process in spatial and territorial planning, the different behaviours in the cases revealed different purposes and attitudes of planning processes for similar schemes.</p>

Source: Adapted from Petticrew and Roberts [38]