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Multi-Sector Sustainability Browser (MSSB) User Manual: A Decision Support Tool (DST) for Supporting Sustainability Efforts in Four Areas - Land Use, Transportation, Buildings and Infrastructure, and Materials Management - Technical Report

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Acronyms/Abbreviations (in MSSB)

3D+R	Destinations, Distance, Density, and Route
ACE	Air, Climate and Energy Research Program
BC	Black Carbon (soot)
BMI	Body Mass Index
BMP	Best Municipal Practices
CAFO	Concentrated Animal Feeding Operation
CCAT	Community Cumulative Assessment Tool
CEHII	Cumulative Environmental Hazard Inequality Index
C-FERST	Community-Focused Exposure and Risk Screening Tool
CFR	Code of Federal Regulations
CH4	Methane
Cl_2	Chlorine
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSO	Combined Sewer Overflow
CSS	Chemical Safety and Sustainability Research Program
DASEES	Decision Analysis for a Sustainable Environment, Economy, and Society
DOSII	Database of Sustainability Indicators and Indices
DOT	Department of Transportation
DSS	Decision Support System
DST	Decision Support Tool
EGS	Ecosystem Goods and Services
EPA	U.S. Environmental Protection Agency
EQI	Environmental Quality Index
FEGS-CS	Final Ecosystem Goods and Services Classification System
FR	Federal Register
GAR	Green Area Ratio
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GI	Green Infrastructure
GIS	Geographic Information System
GIWiz	Green Infrastructure Wizard
GPI	Genuine Progress Indicator
H_2	Hydrogen Gas
H_2O	Water
H_2S	Hydrogen Sulfide
Hg	Mercury
HIA	Health Impact Assessment
HOT	High-Occupancy Toll Lanes
HUD	Housing and Urban Development
HWBI	Human Well-Being Index
IBI	Indices of Biotic Integrity
ICLEI	International Council for Local Environmental Initiatives
ICLUS	Integrated Climate and Land Use Scenarios
IPM	Integrated Planning Model
km	Kilometer
KWh	Kilowatt Hour
LIDAR	Light Detection and Ranging
m	Meter
MSSB	Multi-Sector Sustainability Browser
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standard
NASA	National Aeronautics and Space Administration
NCORE	National Core Air Pollution Monitoring Network
NERL	National Exposure Research Laboratory
NLCD	National Land Cover Database
NNIP	National Neighborhood Indicators Partnership
nm	Nanometer

NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
NPDES	National Pollutant Discharge System
NSF	National Science Foundation
NVI	Neighborhood Vitality Index
O_2	Oxygen
O_3	Ozone
OD	Outer Diameter
ORD	Office of Research and Development
OTAQ	Office of Transportation Air Quality
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PM	Particulate Matter
POTW	Publically Owned Treatment Works
ppm	Parts Per Million
ppb	Part Per Billion
R^2	Coefficient of Determination
RH	Relative Humidity
ROE	Report On the Environment
RTI	Research Triangle Institute
RTP	Research Triangle Park
SHC	Sustainable and Healthy Communities Research Program
SO_2	Sulfur Dioxide
SoVI	Social Vulnerability Index
SSO	Sanitary Sewer Overflow
SSW	Safe and Sustainable Waters Research Program
SVI	Social Vulnerability Index
SWMM	Storm Water Management Model
T-FERST	Tribal-Focused Exposure and Risk Screening Tool
TOD	Transit-Oriented Development
UEQ	(indices of) Urban Environmental Quality
USDA	United States Department of Agriculture
V	Volts
VMT	Vehicle Miles Travelled
VOC	Volatile Organic Compounds
WEPP	USDA Water Erosion Prediction Project Add-On Tool
WWTP	Waste Water Treatment Plant

1.0
Introduction

EPA's Sustainable and Healthy Communities (SHC) Research Program is developing methodologies, resources, and tools to assist community members and local decision makers in implementing policy choices that facilitate sustainable approaches in managing their resources affecting the built environment, natural environment, and human health. In order to assist communities and decision makers in implementing sustainable practices, EPA is developing computer-based systems including models, databases, web tools, and web browsers to help communities decide upon approaches that support their desired outcomes. Communities need access to resources that will allow them to achieve their sustainability objectives through intelligent decisions in four key sustainability areas:

- Land Use
- Buildings and Infrastructure
- Transportation
- Materials Management (i.e., Municipal Solid Waste [MSW] processing and disposal)

The Multi-Sector Sustainability Browser (MSSB) is designed to support sustainable decision-making for communities, local and regional planners, and policy and decision makers.

2.0
Multi-Sector Sustainability Browser (MSSB) Description

The MSSB is an interactive decision support tool (DST) containing information from the scientific literature and technical reports that must be considered when making decisions to support sustainability objectives in the key sustainability areas (Land Use, Buildings and Infrastructure, Transportation, and Materials Management). The MSSB is designed to assist communities in understanding the impacts that sustainable decision alternatives and actions made in the key sustainability areas can have on human health, the economy and the environment (ecosystem services). The MSSB has the following capabilities:

- Generates and displays appropriate linkages between major concepts in four key sustainability decision areas and subordinate concepts related to these areas;
- Displays literature references that provide information about each major concept, the associated subordinate concepts, and weblinks as applicable;
- Displays quantitative data and system parameters related to each major concept and the associated subordinate concepts.

The MSSB can be found on EPA's EnviroAtlas Platform on the following website: (https://www.epa.gov/enviroatlas). The MSSB behaves in a similar manner to EPA's Eco-Health Relationship Browser (https://www.epa.gov/enviroatlas/enviroatlas-eco-health-relationship-browser). The Eco-Health Relationship Browser is documented in the literature (Jackson, L. E., Daniel, J., McCorkle, B., Sears, A., Bush, K. F., "Linking ecosystem services and human health: the Eco-Health Relationship Browser", October 2013, International Journal of Public Health, Volume 58, Issue, 5, pp 747 – 755: DOI 10.1007/s00038-013-0482-1). This browser is also located on the EPA's EnviroAtlas website (https://www.epa.gov/enviroatlas). The MSSB provides a new capability integrated into EPA's EnviroAtlas platform, and can be thought of as a 'visual database' of sustainability knowledge in the four key sustainability areas.

3.0
Use of Multi-Sector Sustainability Browser (MSSB) – Disclaimer

The MSSB is not a full Decision Support System (DSS), which would provide a range of alternative decision choices or pathways based on the nature of the input data. Instead, this tool is designed for the user to investigate one or more of the four key sustainability areas, explore the available scientific literature references, and from the information, assess the potential impact of planned sustainability initiatives on desired decision objectives. Note, the references presented in the MSSB represent an extensive, but not comprehensive, bibliography of sustainability science, engineering, and policy. The MSSB reduces the amount of time and effort that a user interested in understanding the current scientific knowledge in sustainability science and engineering, as applied in the context of Land Use, Buildings and Infrastructure, Transportation, and Materials Management, is required to spend collecting the initial information to determine the important considerations required for decision-making. The MSSB should be used for the following activities:

- Exploring the linkages between the four key sustainability areas;
- Obtaining information on a specific sub-discipline/ question area in one or more of the four key sustainability areas;
- Assessing the number of relevant references that should be read by subject-matter experts in one or more of the four key sustainability areas;
- Determining if there are important system parameters or variables (including their values and/or ranges) that can influence a decision in one or more of the four key sustainability areas;
- Learning about the influence of sustainability, practices, activities and/or metrics on human health, the natural environment, and the economy;
- Developing a plan for a scientific literature review in one or more of the four key sustainability areas;
- Creating a framework for an approach to develop a structured approach to decision-making in the context of one or more of the four key sustainability areas;
- Examining the importance of Land Use in all sustainability-related activities and decisions;
- Building a database of available resources in the scientific literature related to sustainability;
- Investigating the tools, databases, models, libraries, and browsers that are available for providing information and data for planned sustainability initiatives and decisions;
- Initiating a literature review in one or more of the four key sustainability areas.

The quality assurance approach used in developing the MSSB software is documented in the SED Software Development QA Guidance Document. The design of the MSSB is documented in the Workplan/Design and Software Development Quality Assurance Project Plan, QAPP-1J16-010.R1. Any questions or comments on the operation of the MSSB should be directed to Eric S. Hall, hall.erics@epa.gov.

4.0
Summary

The MSSB is not a full Decision Support System (DSS), but this tool is designed for the user to investigate one or more of the four key sustainability areas, explore the available scientific literature references, and assess the potential impact of planned sustainability initiatives on desired decision objectives. The MSSB reduces the amount of time and effort required to find information on sustainability science and engineering in the context of Land Use, Buildings and Infrastructure, Transportation, and Materials Management.

5.0
References:

1. SED Software Development QA Guidance Document (SED_Software_Development_QA_Guidance_2a.pdf), US EPA, National Exposure Research Laboratory (NERL), Systems Exposure Division (SED), 22 April 2016, pp 6
2. Workplan/Design and Software Development Quality Assurance Project Plan, QAPP-1J16-010.R1, 11 July 2016, pp 35
3. Jackson, L. E., Daniel, J., McCorkle, B., Sears, A., Bush, K. F., "Linking ecosystem services and human health: the Eco-Health Relationship Browser", October 2013, International Journal of Public Health, Volume 58, Issue, 5, pp 747 – 755: DOI 10.1007/s00038-013-0482-1

Appendix:
Operation of the Multi-Sector Sustainability Browser (MSSB)

The MSSB displays can be viewed on a desktop computer using a computer mouse, page up and page down keys, and arrow keys on the computer keyboard. The MSSB was designed to be accessible by laptop computers, tablets, and smartphones. No special software is required to use the MSSB, and any standard browser can be used with the MSSB. When using a desktop computer, displays can be selected either by use of the drop-down list menu or through direct selection of the displays using a mouse (as indicated in Figure 1). Figure 1 illustrates the default display screen that is shown when the MSSB is initially selected.

The MSSB has multiple levels of displays, with top-level displays representing primary sustainability concepts, and subordinate displays representing supporting concepts, questions, or relationships between different concepts. The displays are outlined either in green or in gray. Green outlines indicate that selecting the display will reveal additional lower levels of displays (and related concepts). Gray outlines indicate that there are no lower level displays under the selected display, although additional information is provided. This is illustrated in Figure 2. Each display that is selected has a text box with information explaining or defining the major concept in the selected display. Important resources, such as technical reports, scientific journal articles, and websites containing tools, models, databases, and calculators, can be accessed in the MSSB through the weblinks that are provided in the applicable display text boxes.

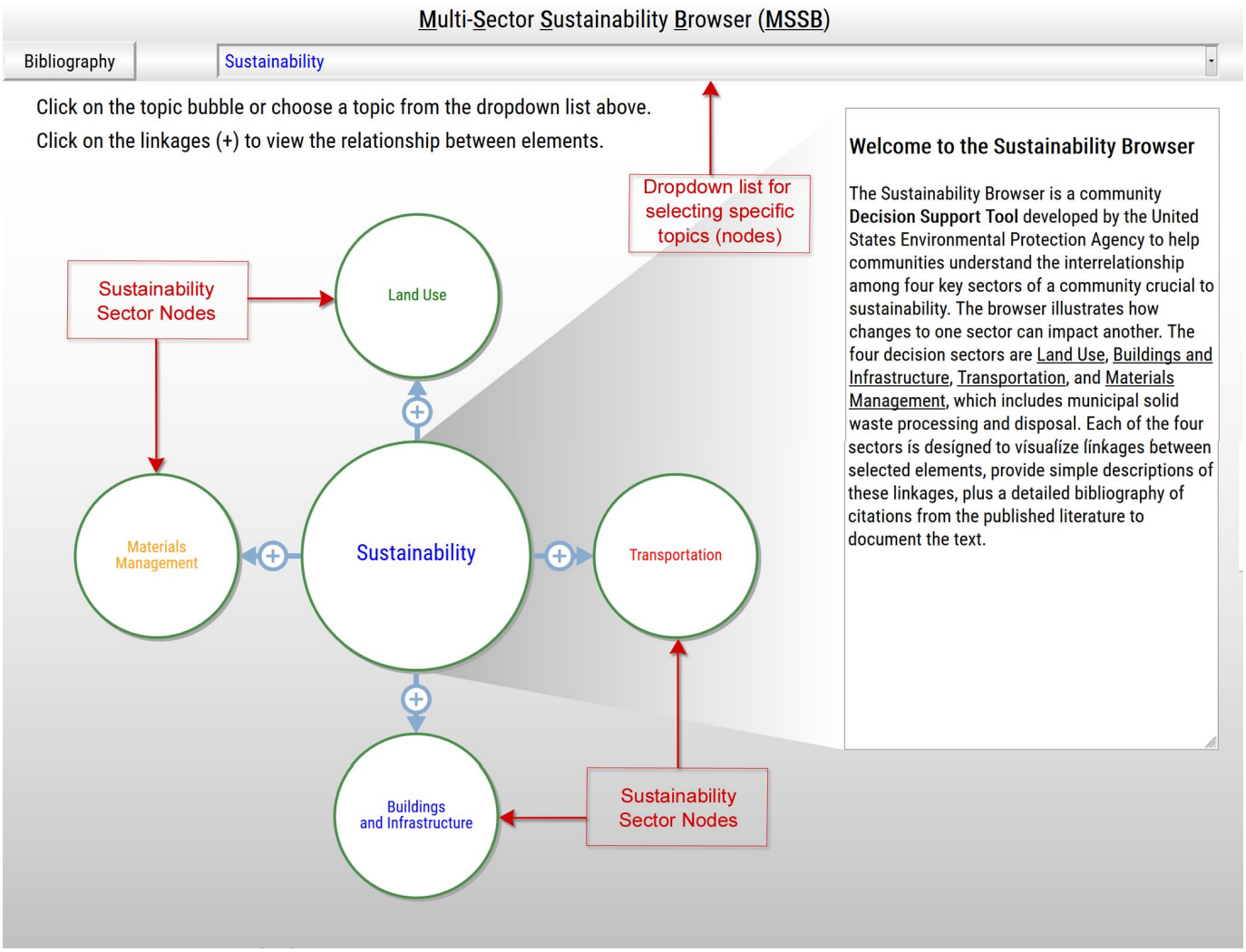


Figure 1. The MSSB Main Screen (Sustainability) shown with text labels pointing to the topics in the graphical display elements and the drop-down menu selection list.

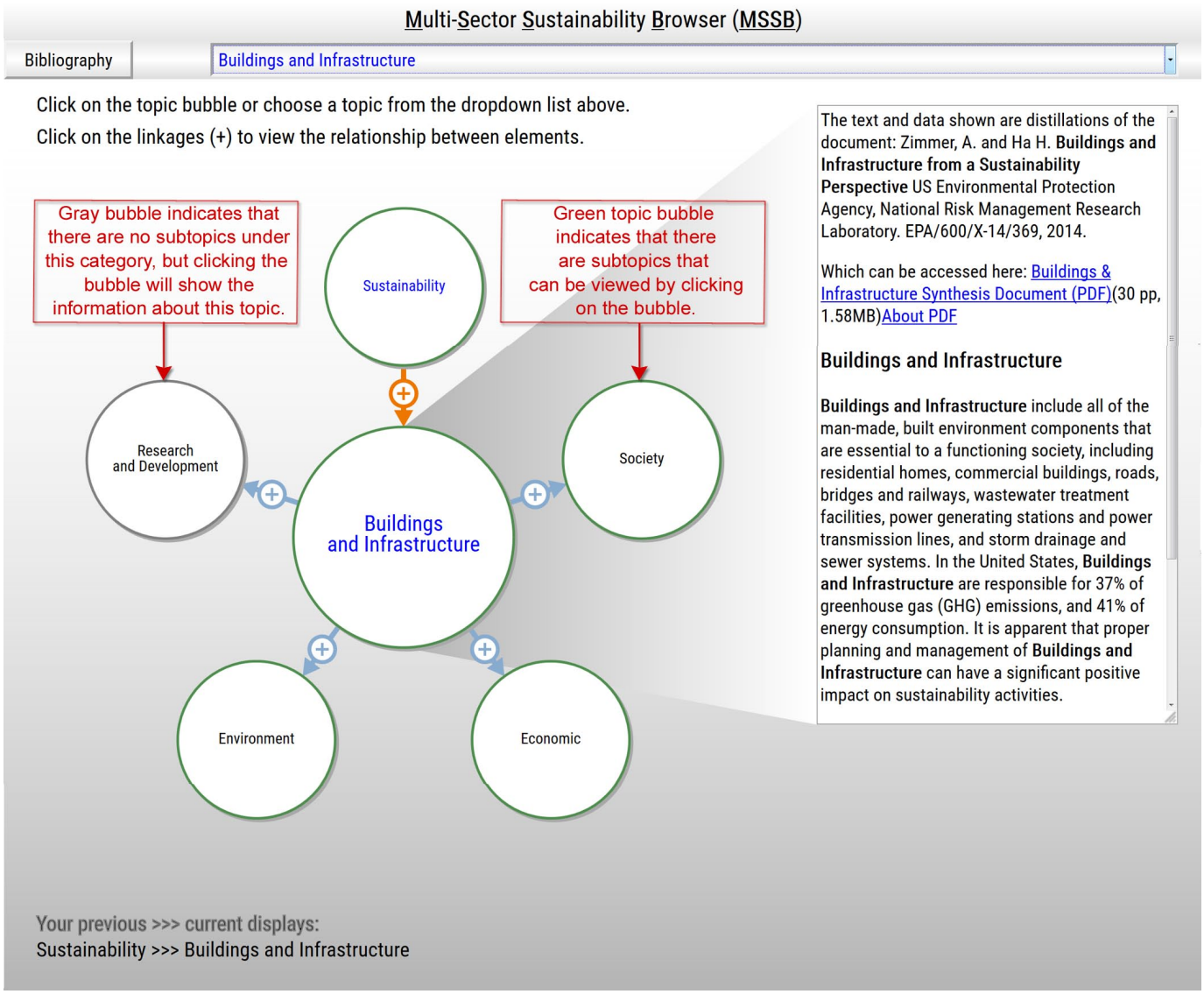


Figure 2. The Buildings and Infrastructure Main Screen with text labels identifying a green outline on a topic 'bubble' and a gray outline on a topic 'bubble'.

Figure 3 illustrates what is shown when the gray outlined topic in Figure 2 is selected. The Research and Development topic area appears with information on the research and development being conducted on Buildings and Infrastructure..

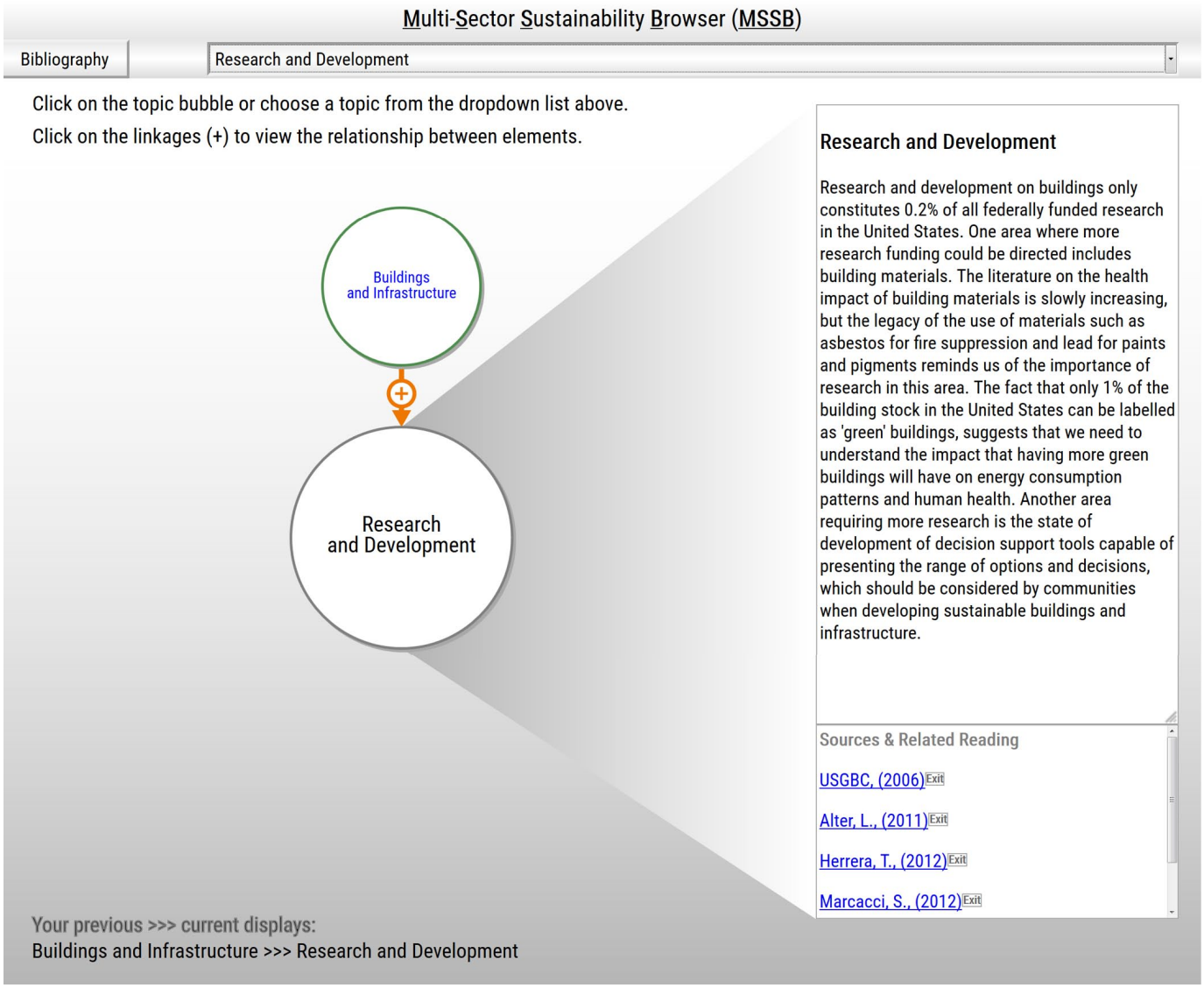


Figure 3. Buildings and Infrastructure: Research and Development sub-topic gray 'bubble'.

Figure 4 illustrates what is shown when a green outlined topic in Figure 2 is selected. Links to the Society topic area appear along with links to the Health and Demographics sub-topic areas that provide information on the interplay between populations, health, and buildings.

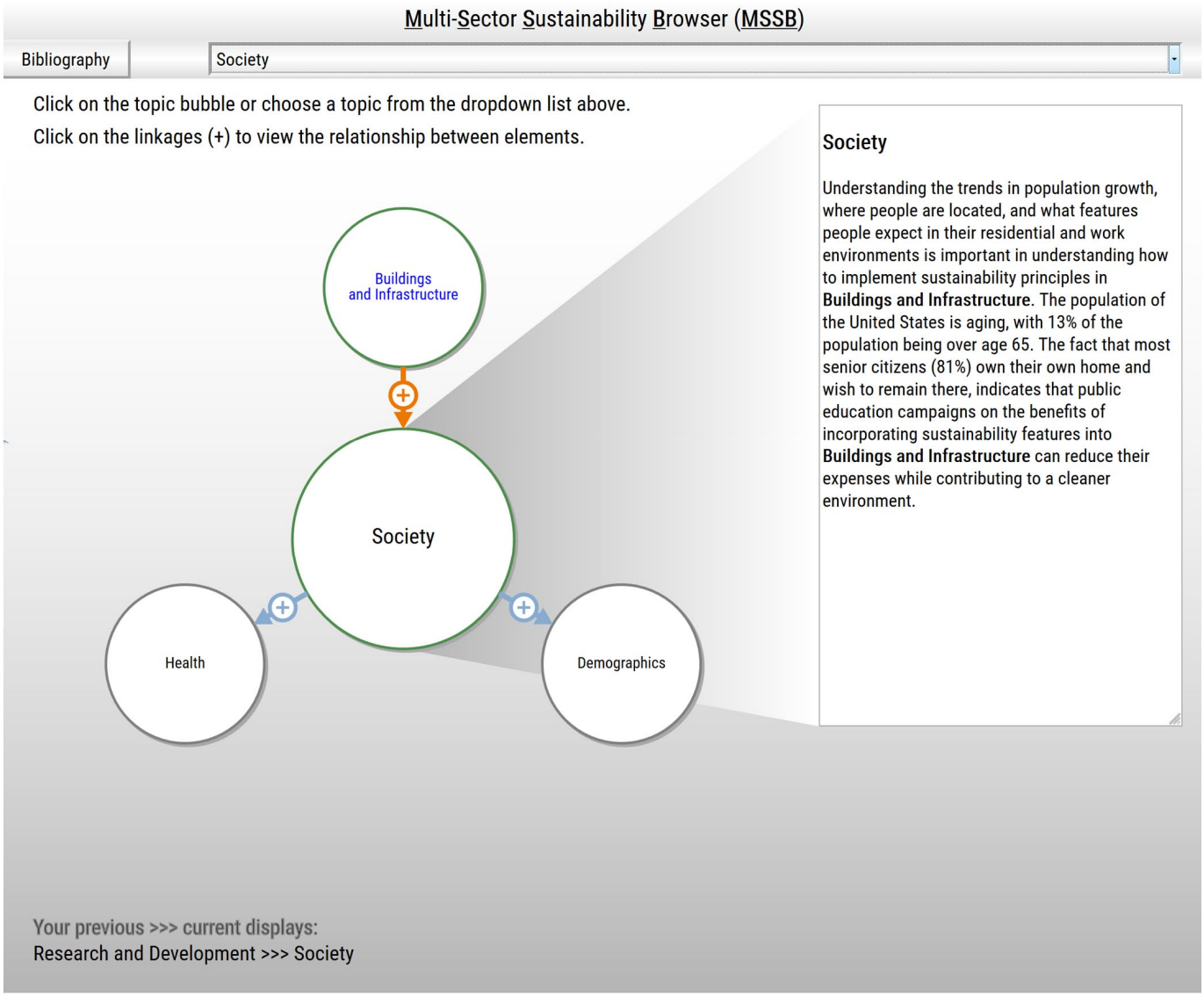


Figure 4. Buildings and Infrastructure: Health and Demographics sub-topics linked to the Society topic green 'bubble'.

The bibliography button reveals references for each of the four sustainability areas, Land Use, Transportation, Buildings and Infrastructure, and Materials Management. The references in the bibliography are arranged in the order in which they were cited in each of the technical reports associated with the four key sustainability areas (Land Use, Transportation, Buildings and Infrastructure, and Materials Management) which were used to develop the MSSB. Selecting the 'Bibliography' button, located in the upper left-hand corner of the MSSB will display the bibliography webpage.

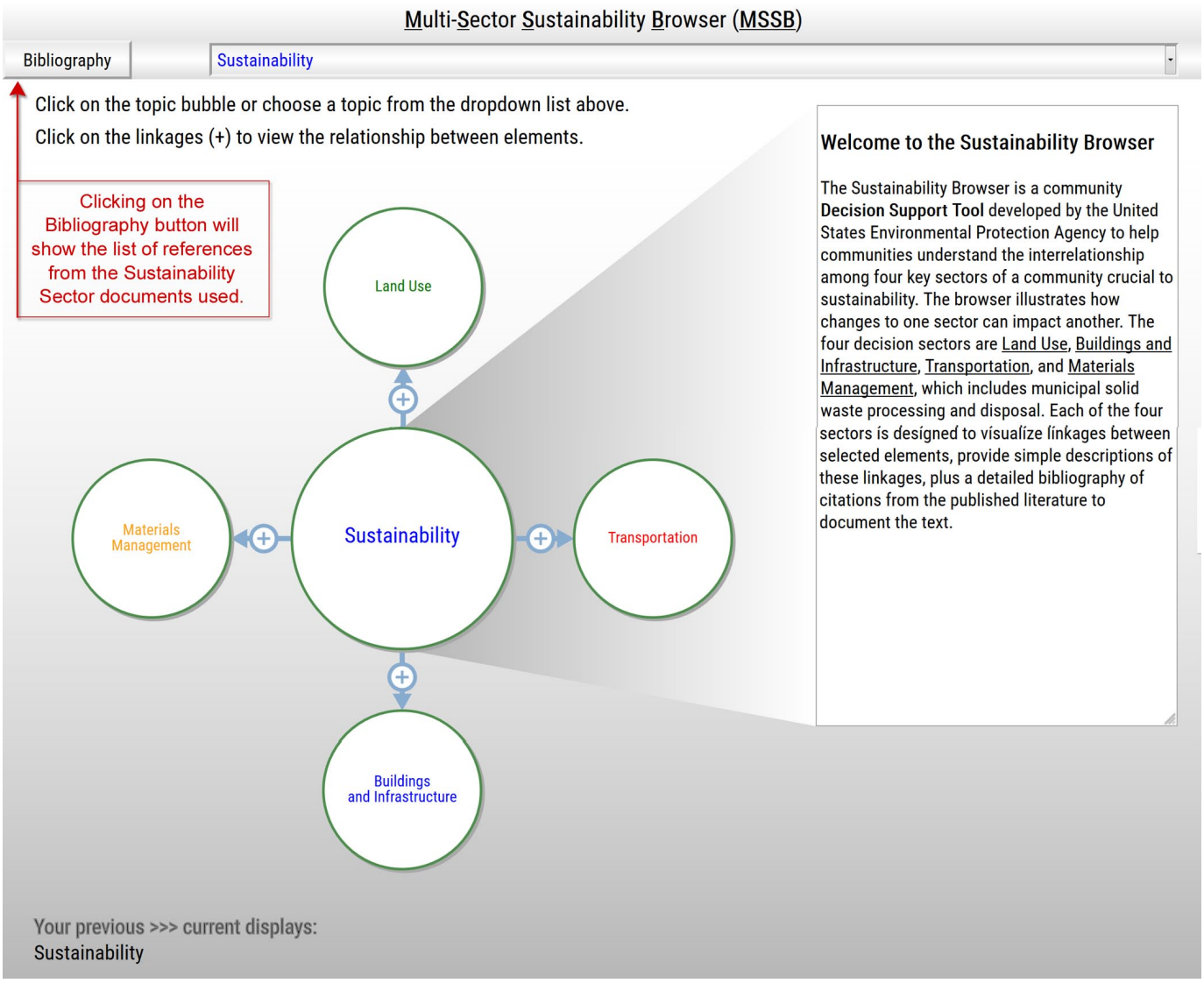
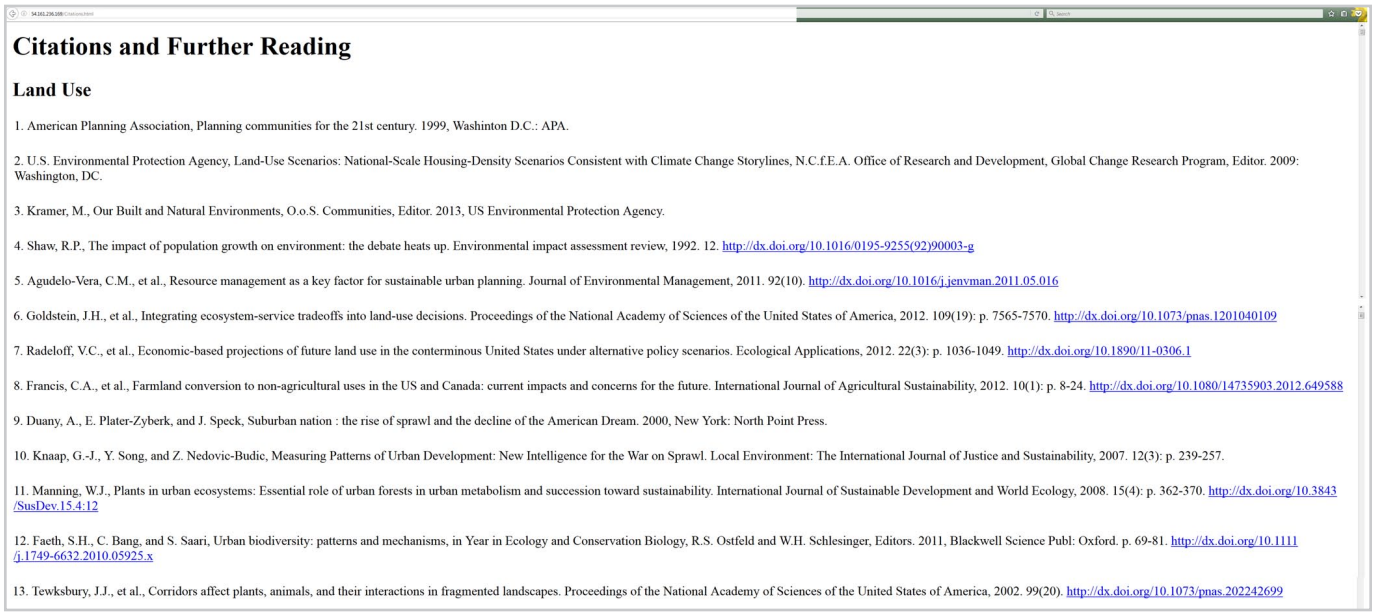


Figure 5. The MSSB main screen with a text label pointing to the Bibliography Button.

When the 'Bibliography' button is selected, the bibliography webpage is displayed in Figure 6. This webpage contains the citation information for the references, and provides weblinks to the references for those users who wish to learn more information and possibly download the reference(s), as applicable. Note that some of the references may be obtained at no cost, while others may have a cost associated with them based on the individual journal. EPA is not responsible for the potential cost of the references linked to in the MSSB.



Citations and Further Reading

Land Use

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Figure 6. Result of selecting the Bibliography Button.

The MSSB uses a display element that is shown as a ‘plus sign’ surrounded by a circle to indicate some type of relationship, linkage, or connection between the topics that are connected by them. When the ‘plus sign’ is selected, a text box is displayed that provides information on the relationship between the two connected topics. Figure 7 illustrates the text box that provides information on the relationship between residential land use and residential segregation.

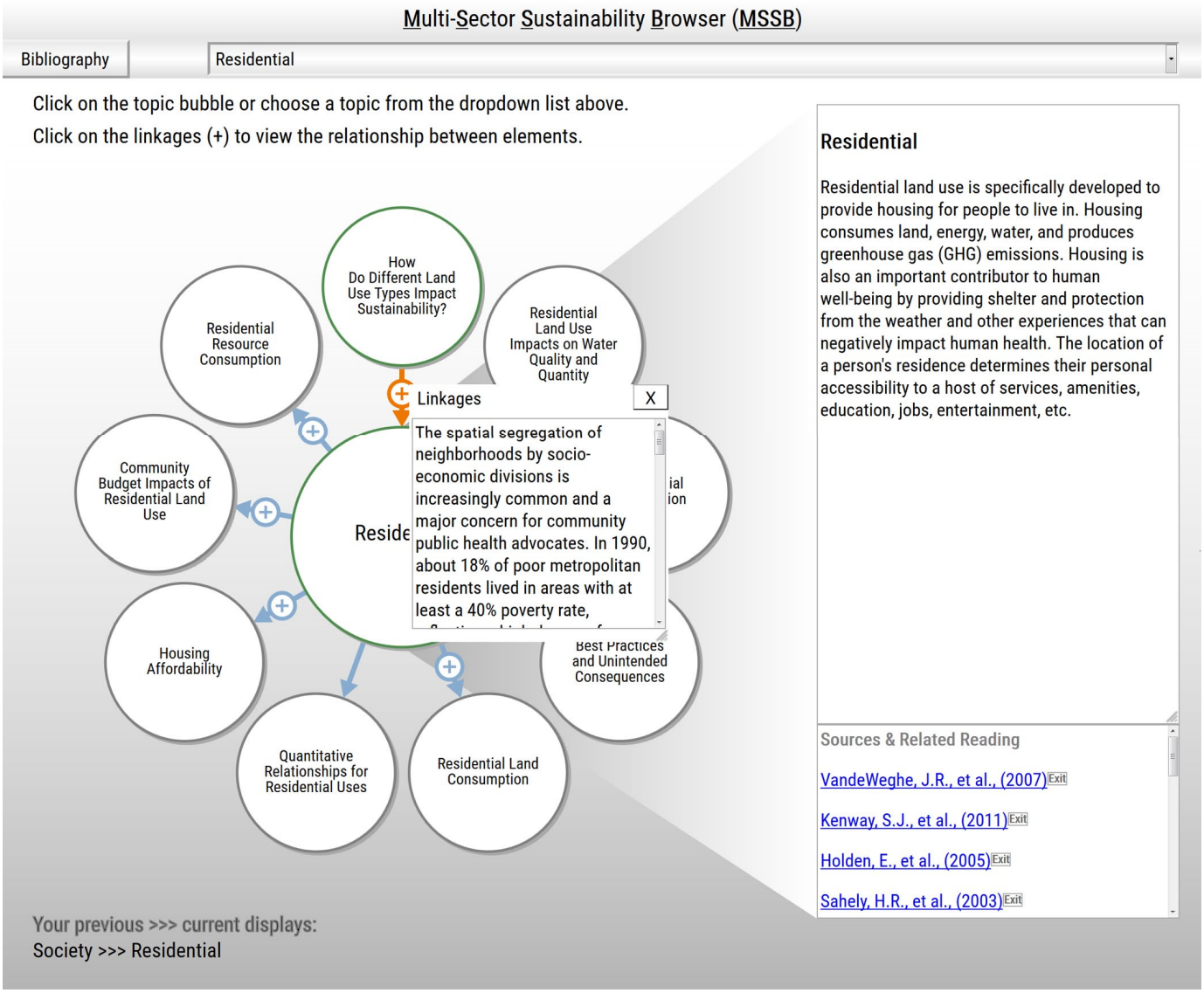

Figure 7. Expanded Text Box with Information on the Relationship between Residential (Land Use) and Residential Segregation when the "+" sign is selected.

The most extensive component of the MSSB is the Land Use component. This is the most extensive component because the other three sustainability components (Transportation, Buildings and Infrastructure, and Materials Management) are dependent on how land is used in implementing them. Each of the key Land Use topics shown in the main screen have lower levels of topics with additional information, as shown in Figure 8.

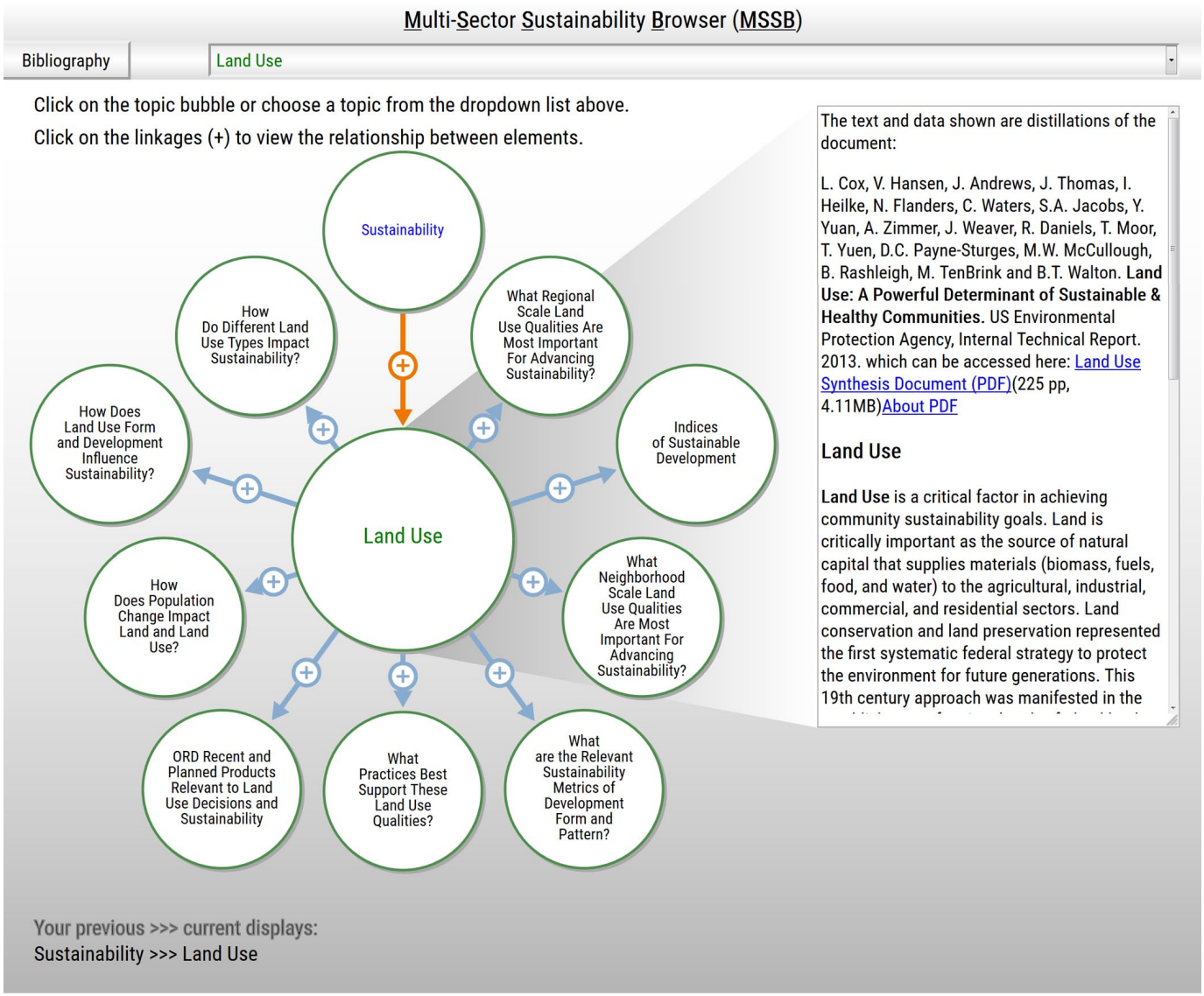

Figure 8. The Land Use Main Screen displaying the Land Use primary topics.

When one of the Land Use topics is selected, it displays its subordinate (lower-level) topics containing additional information. Weblinks to the applicable references are displayed in the lower portion of the text box area. An example is shown in Figure 9

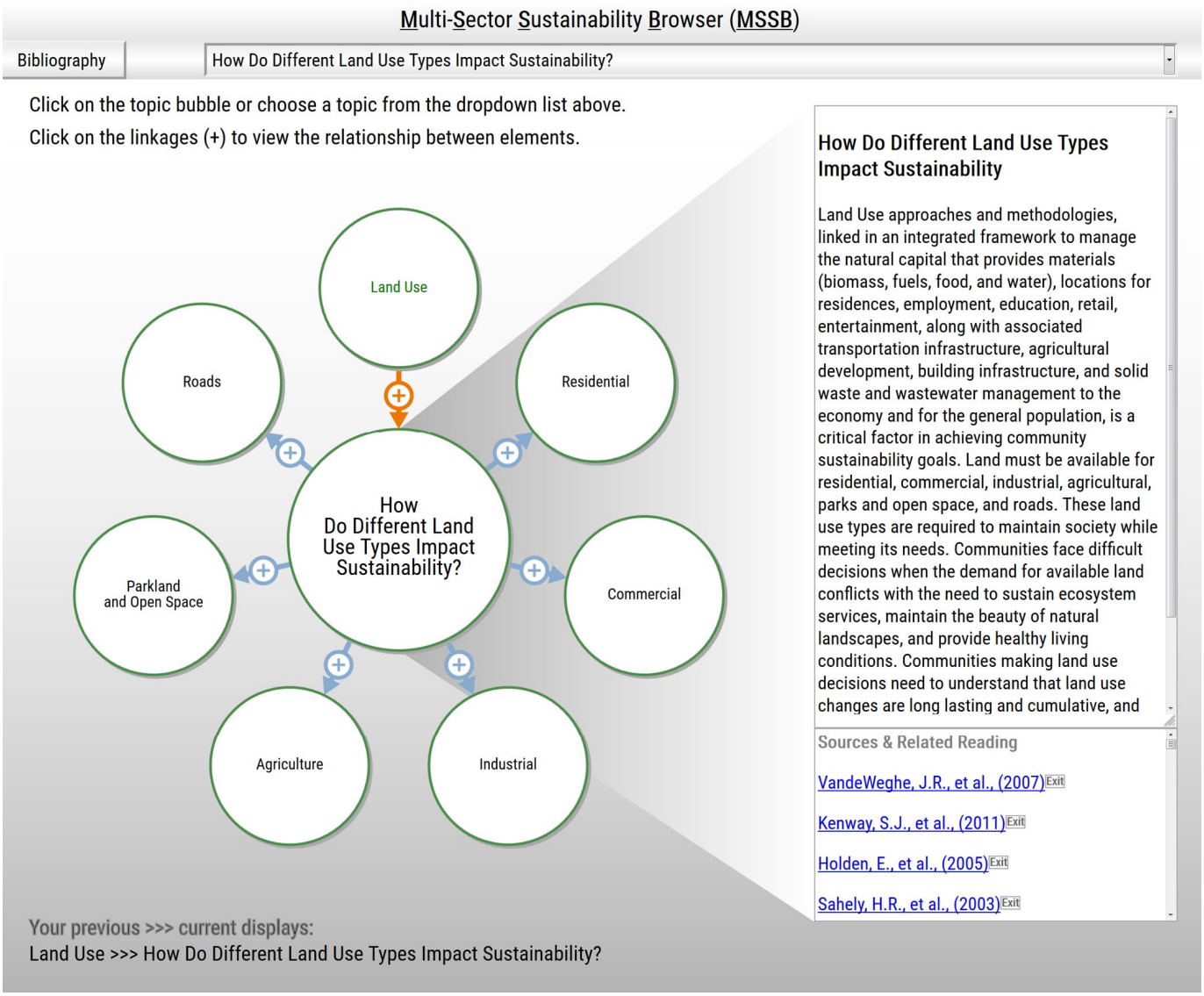

Figure 9. The lower-level topics shown when the 'How do Different land Use Types Impact Sustainability' topic is selected.

When one of the 'How do Different Land Use Types Impact Sustainability' topics is selected, it shows a lower-level topic containing additional information. Figure 10 shows the result when the lower-level 'Residential' topic is selected. Weblinks to the applicable references are displayed in the lower portion of the text box area.

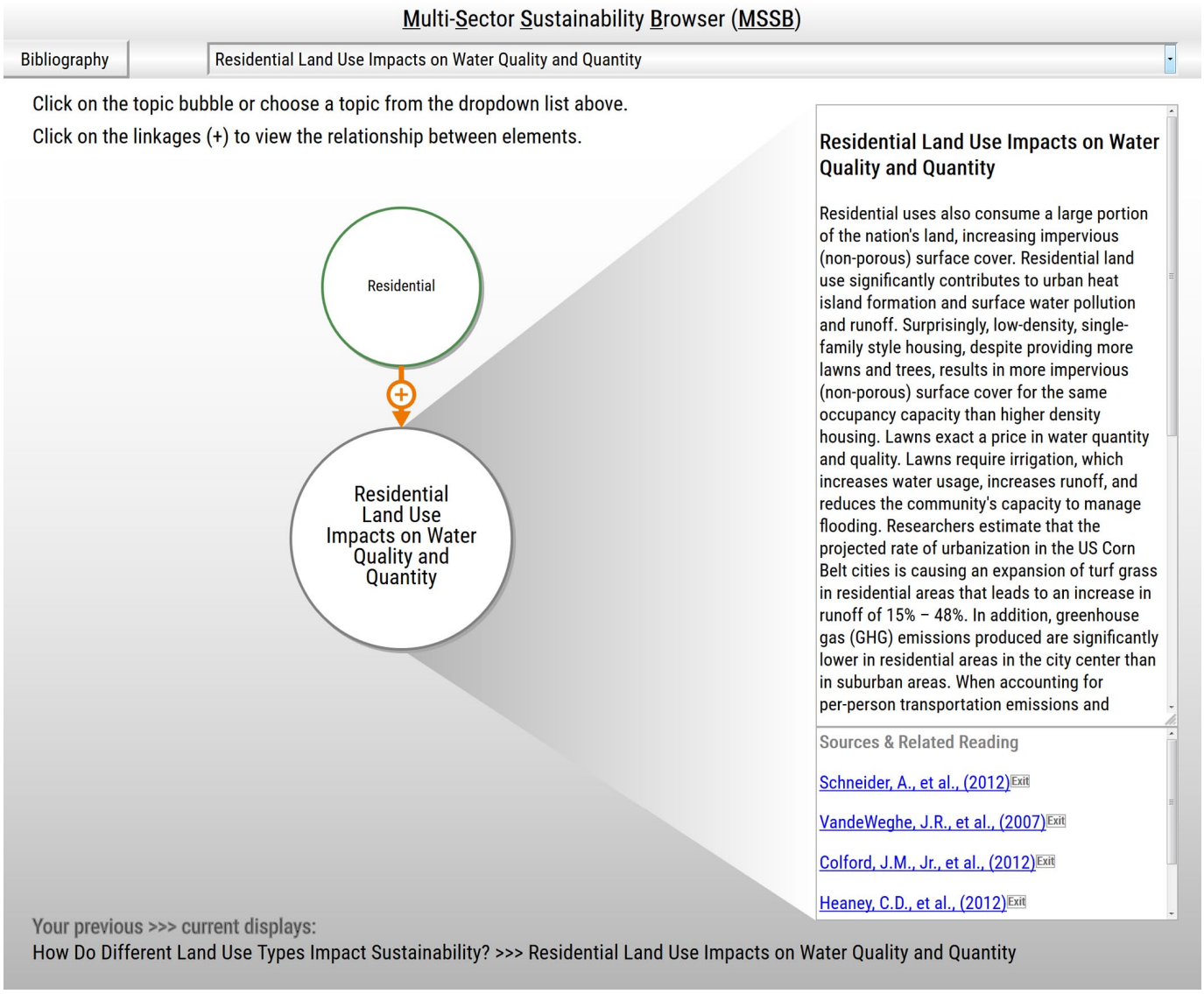

Figure 10. The display shown when the 'Residential' sub-topic under How do Different Land Use Types Impact Sustainability is selected.

The Transportation main display screen is shown in Figure 11. Each of the key Transportation displays shown in the main screen, with the exception of the 'Integrated Tools, Resources, and Indicators' display, have lower levels of displays with additional information, as shown in Figure 11.

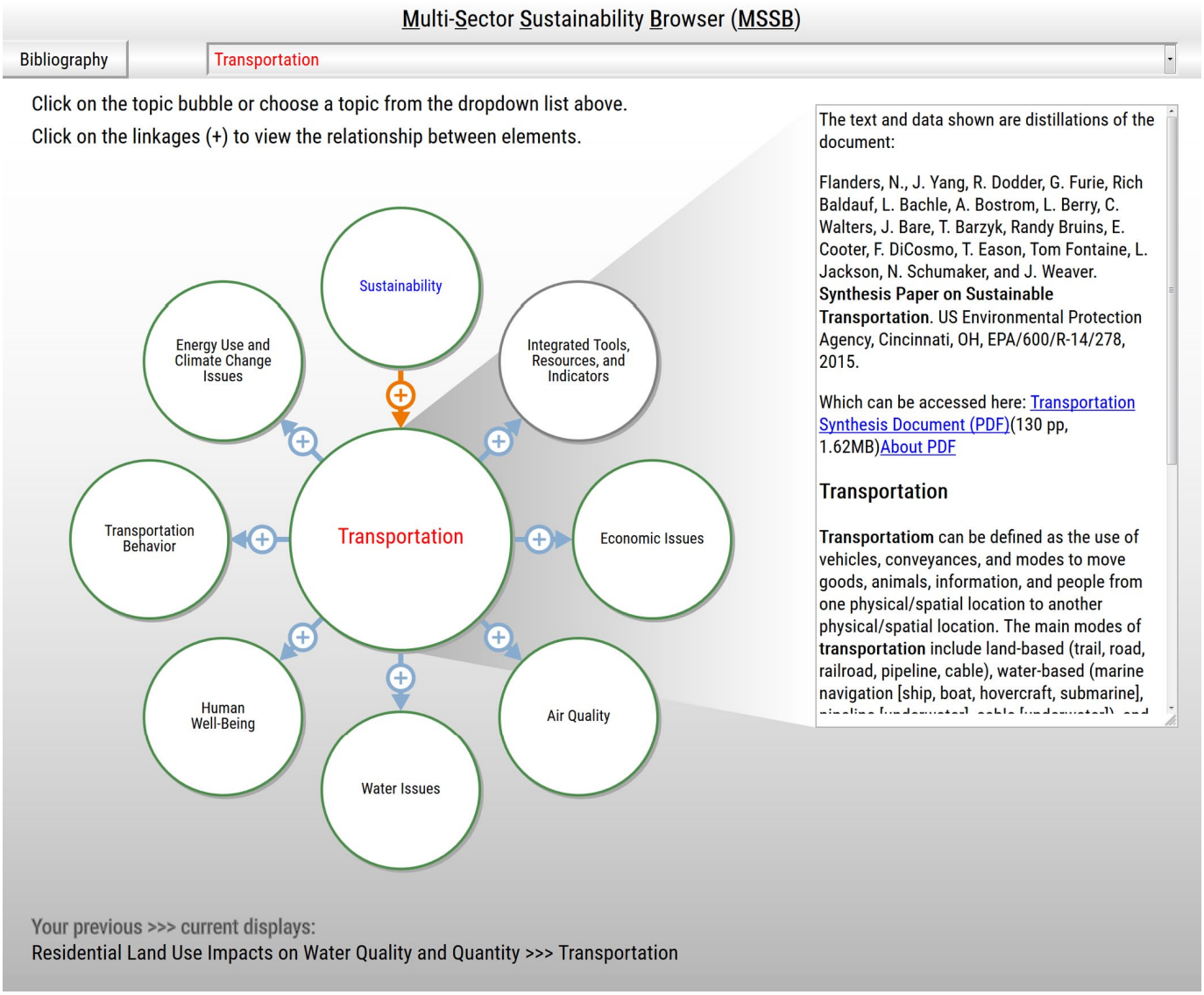

Figure 11. The Transportation Main Screen illustrating the primary Transportation topics.

When one of the Transportation topics is selected, it displays its subordinate (lower-level) topics containing additional information. When the 'Energy Use and Climate Change Issues' topic is selected, the result is shown in Figure 12. Weblinks to the applicable references are displayed in the lower portion of the text box area.

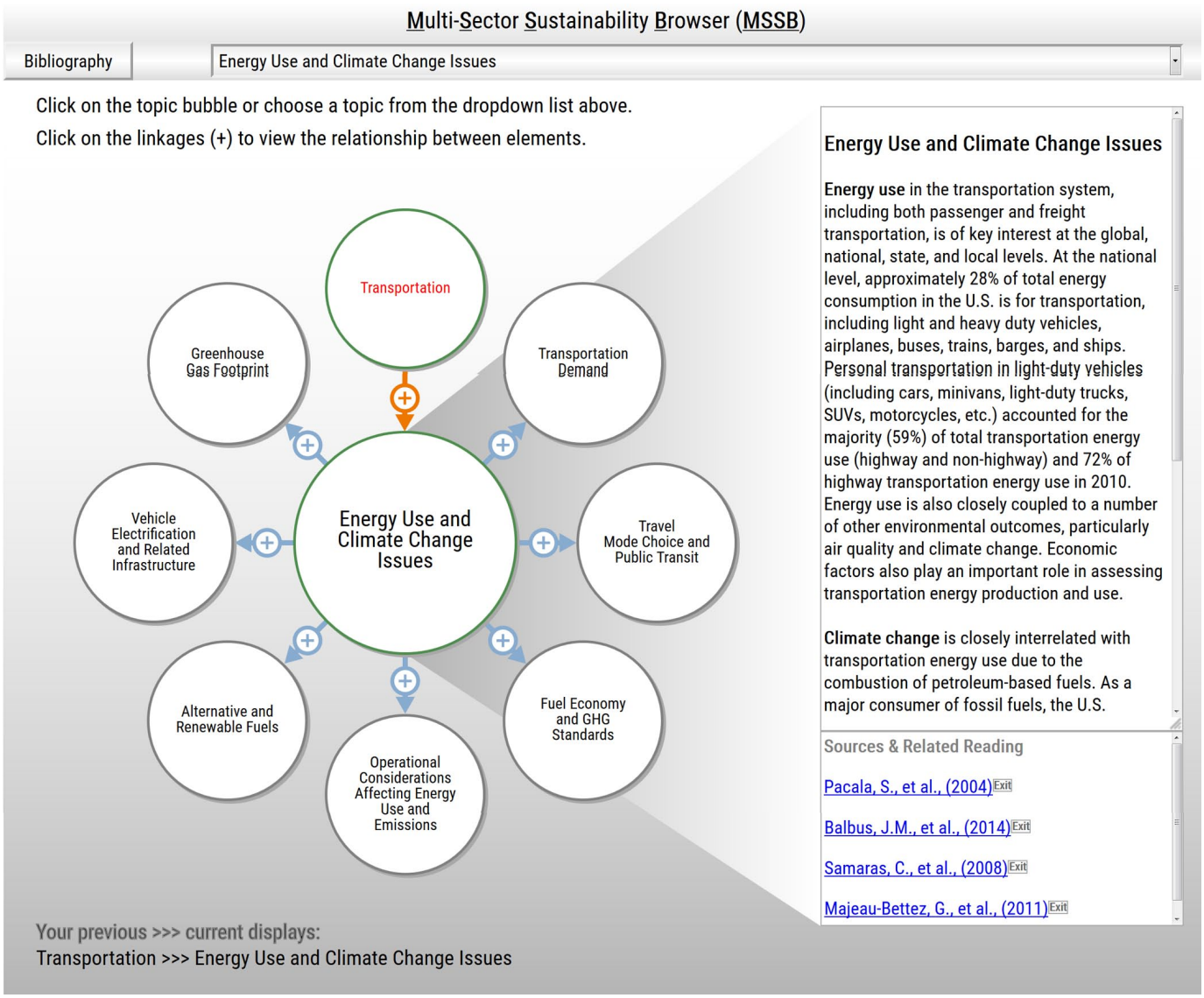

Figure 12. The display shown when the 'Energy Use and Climate Change Issues' sub-topic under Transportation is selected.

When the 'Integrated Tools, Resources, and Indicators' topic is selected from the Transportation main display screen, the result is shown below in Figure 13. Weblinks to the applicable references are displayed in the lower portion of the text box area.

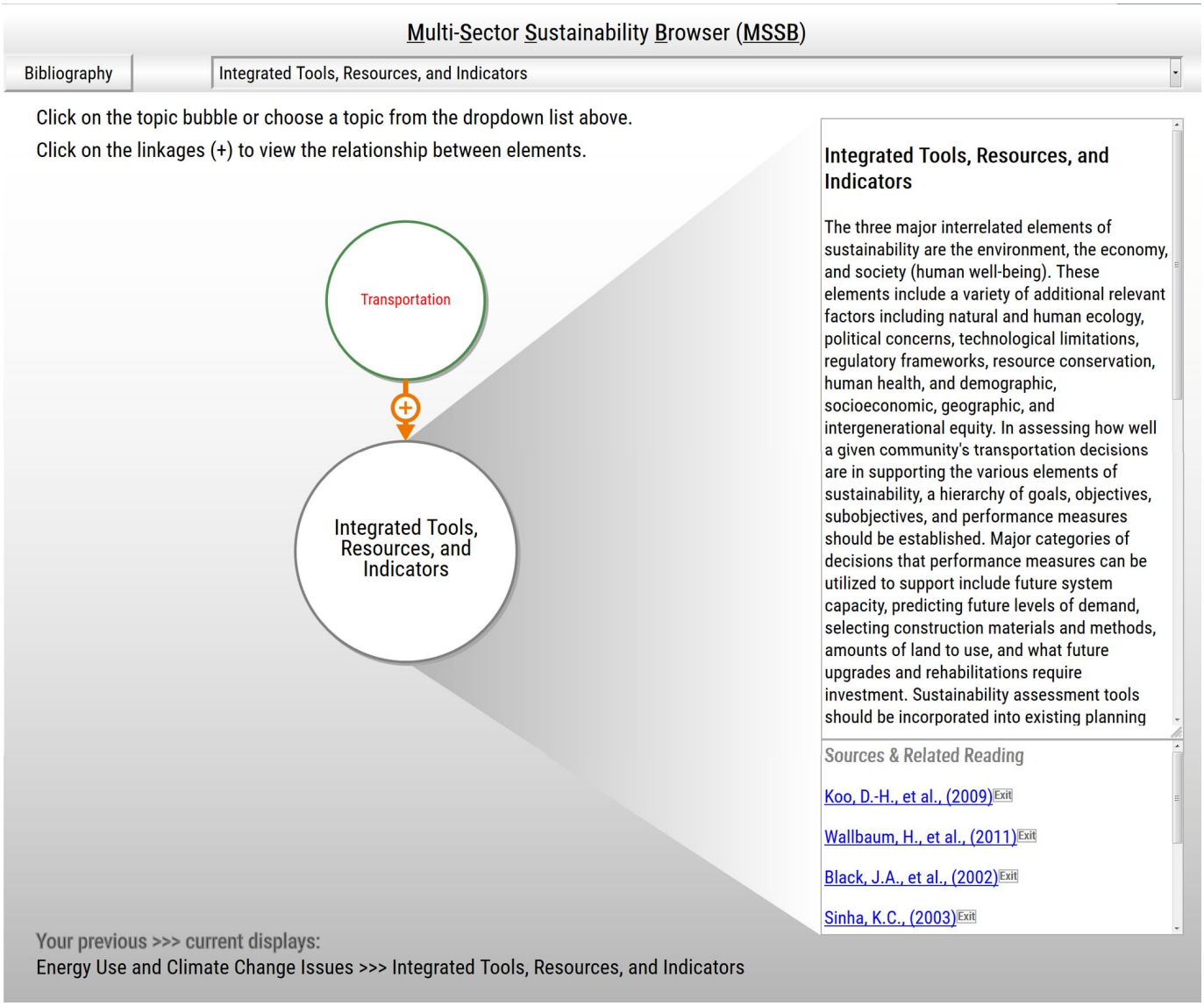

Figure 13. The display shown when the 'Integrated Tools, Resources, and Indicators' sub-topic under Transportation is selected.

The Materials Management main display screen is shown in Figure 14. Each of the key Materials Management topics shown in the main screen has lower levels of topics with additional information, as shown in Figure 14.

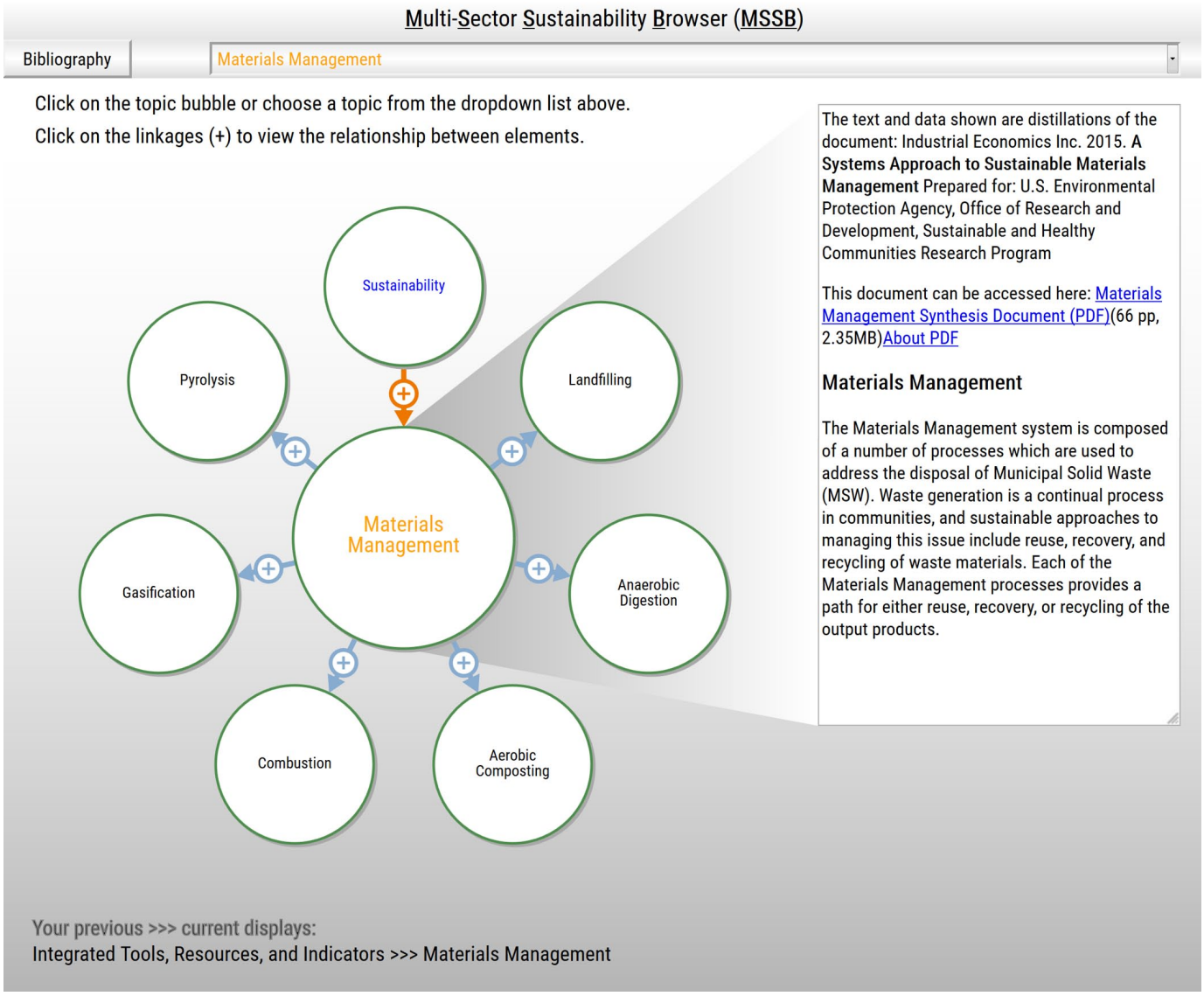

Figure 14. The Materials Management Main Screen primary topics.

When one of the Materials Management topics is selected, it displays its subordinate (lower-level) topics containing additional information. When the 'Anaerobic Digestion' topic is selected, the result is shown in Figure 15.

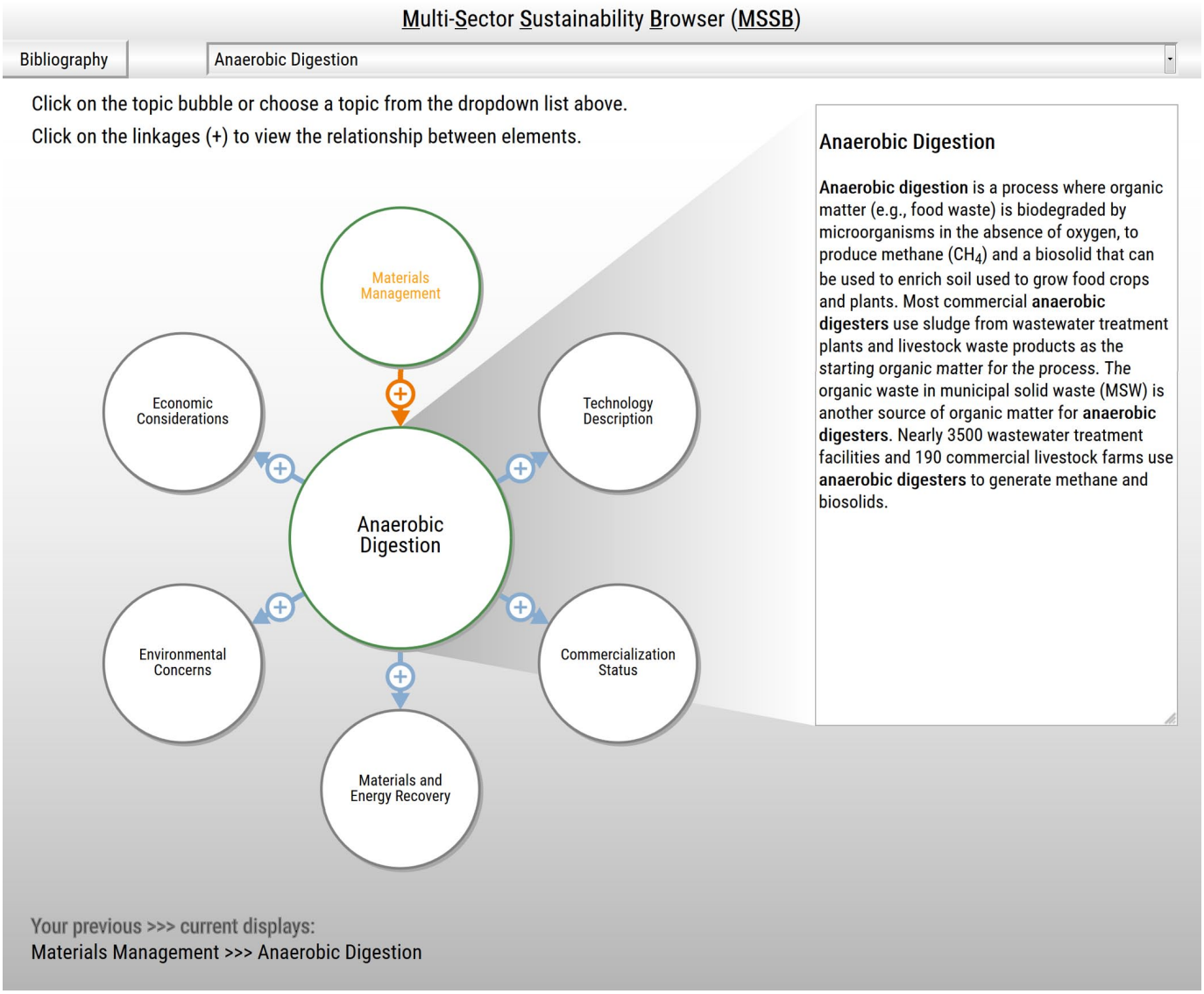

Figure 15. The lower-level topics shown when the 'Anaerobic Digestion' topic is selected.

When the 'Technology Description' topic is selected from the Anaerobic Digestion display screen, the result is shown below in Figure 16. Weblinks to the applicable references are displayed in the lower portion of the text box area.

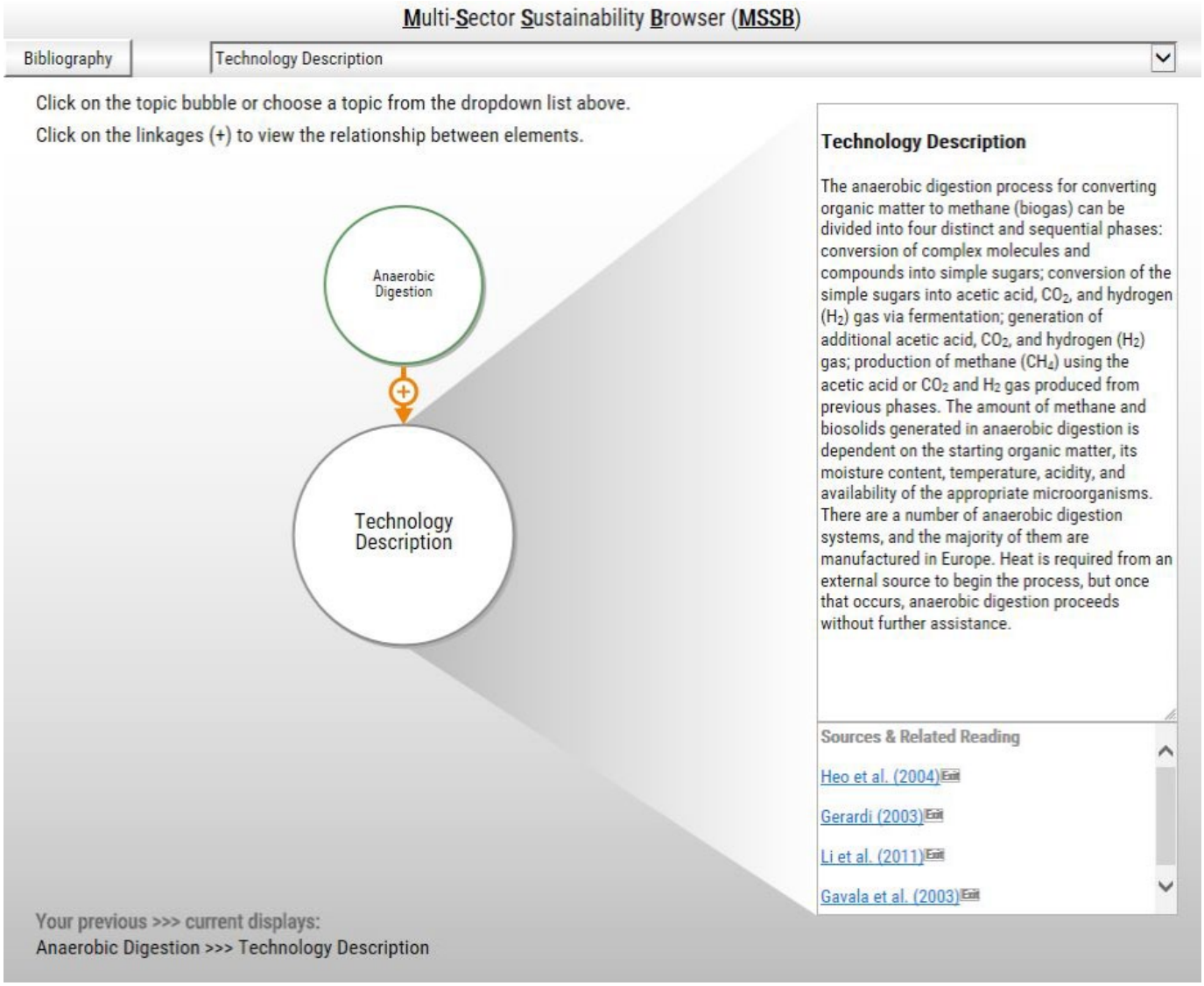

Figure 16. The display shown when the 'Technology Description' sub-topic under Anaerobic Digestion is selected.

The Buildings and Infrastructure main display screen is illustrated below. Each of the key Buildings and Infrastructure topics shown in the main screen, with the exception of the 'Research and Development' topic, has lower levels of displays with additional information, as shown in Figure 17.

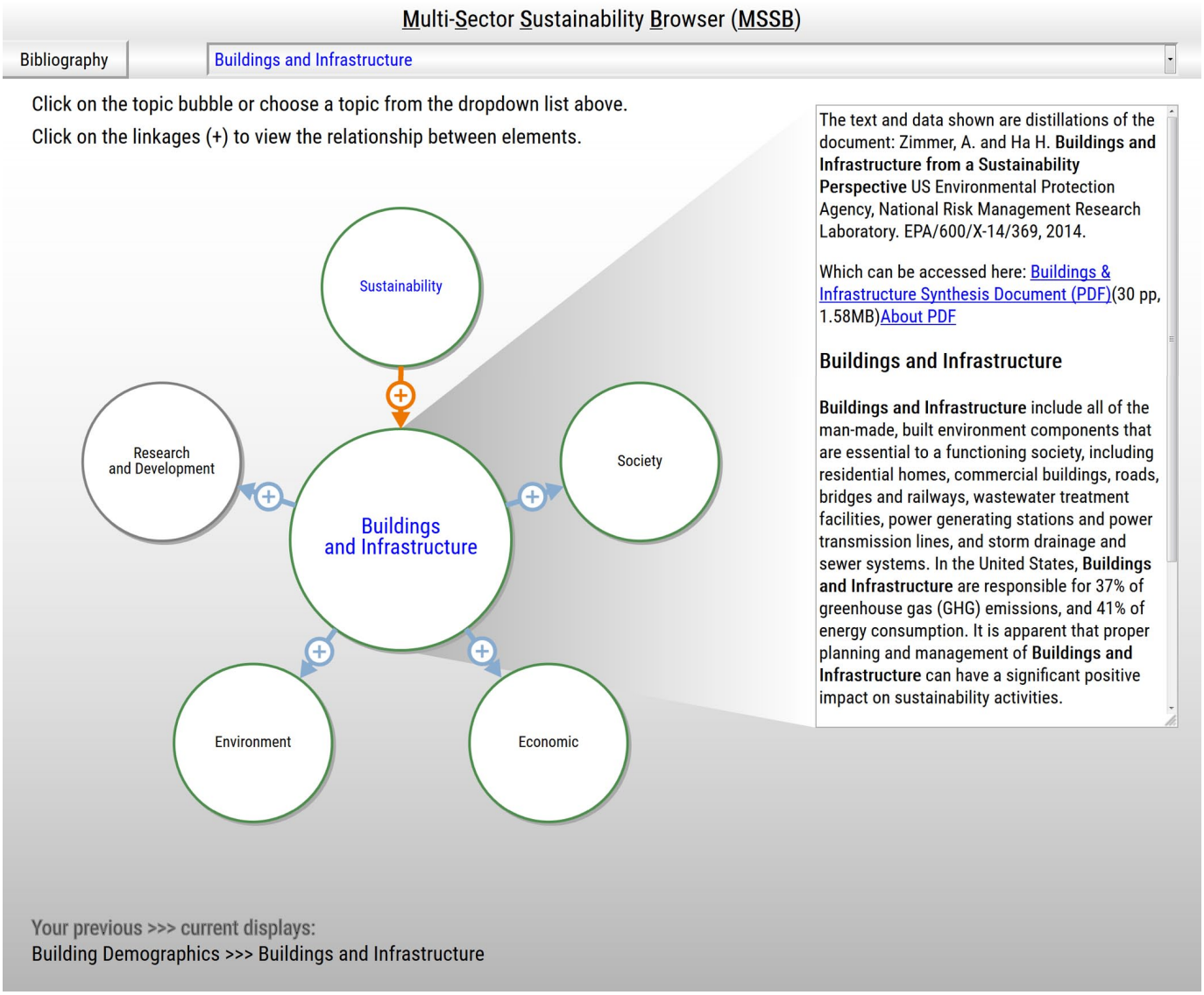

Figure 17. The Buildings and Infrastructure primary topics.

When one of the Buildings and Infrastructure topics is selected, it displays its subordinate (lower-level) topics containing additional information. When the 'Economic' topic is selected, the result is shown in Figure 18.

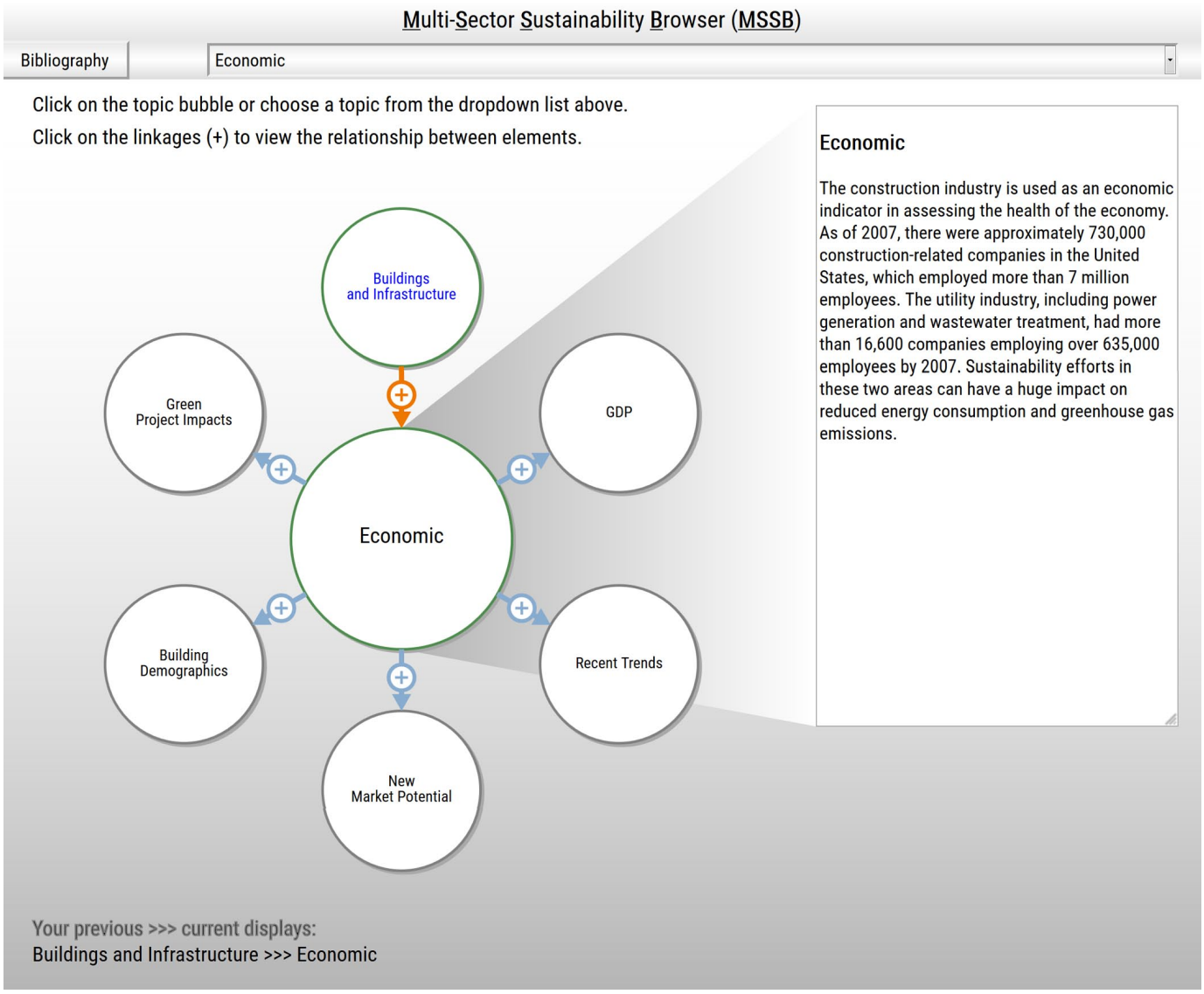

Figure 18. When the 'Economic' topic is selected from the Buildings and Infrastructure display, the result is shown in Figure 18.

When the 'GDP' topic is selected from the Economic sub-topic under the Buildings and Infrastructure display, the result is shown in Figure 19.

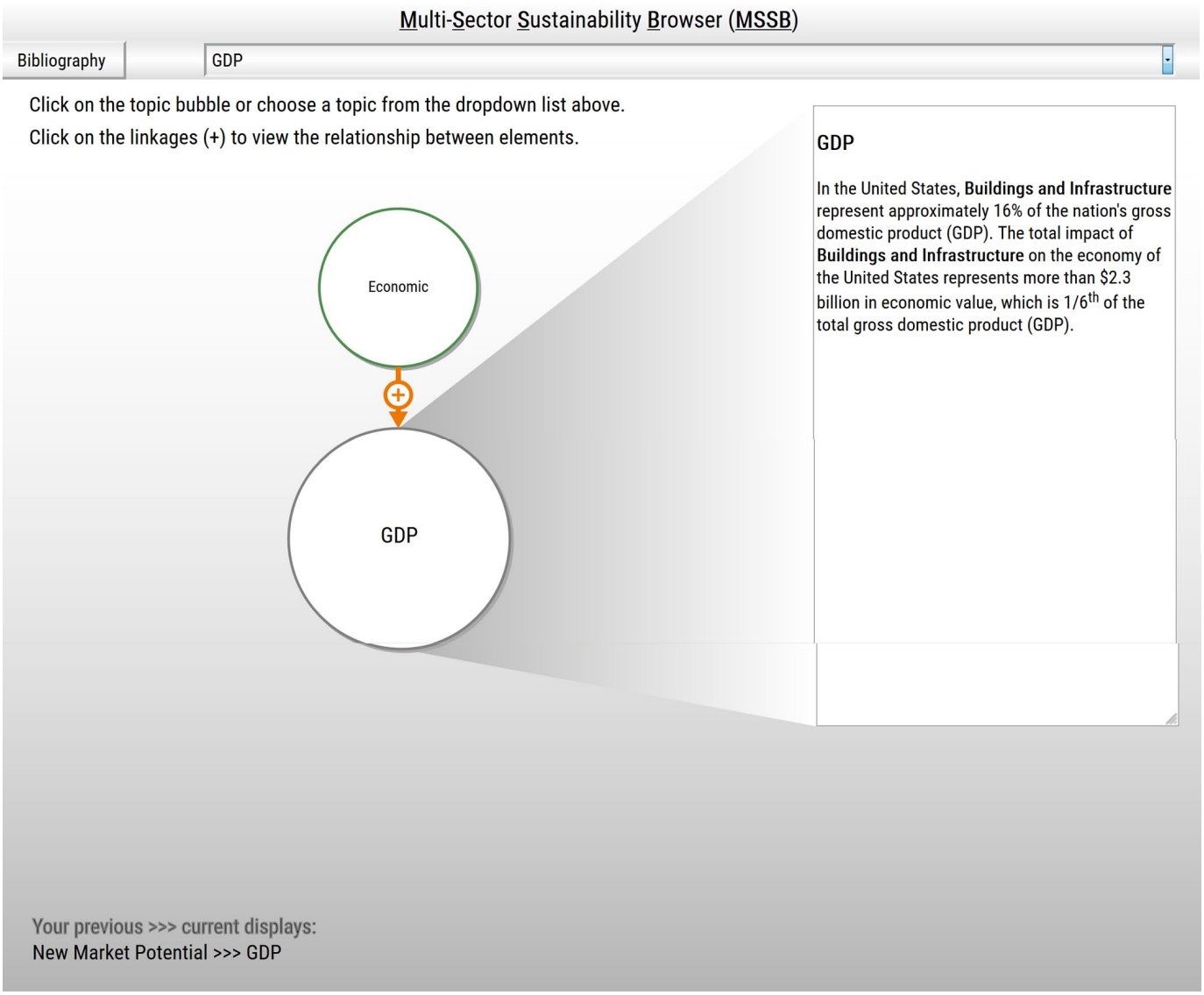

Figure 19. The display shown when the 'GDP' sub-topic under Economic is selected.

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