

Curriculum Connections to the SDGs

Use This Guide Within Your Curriculum

The goal of the STEM Fair is to supplement, not replace, your existing science or STEM content. We want you to use lessons provided in the Teacher Guide where appropriate to support, enrich, and extend it. We also want you to adapt the lessons to fit your school's curriculum, your students' needs, and your own teaching style. This section provides easy-to-understand connections for teachers to use and help implement pieces of the Sustainable Development Goals into their classroom. The connections are made using the K-12 Framework (NGSS) and Common Core Math Standards.

Next Generation Science Standards

The standards were developed around three major dimensions: 1 – Scientific and Engineering Practices, 2 – Crosscutting Concepts, 3 – Disciplinary Core Ideas. These three dimensions are the key components of the NGSS. For this document, the connections to the NGSS will be Disciplinary Core Ideas (DCI). These are concepts in science and engineering that have broad importance within and across disciplines as well as relevance in people's lives. Each DCI has a collection of several performance expectations describing what students should be able to do at the end of instruction. These performance expectations can be easily found by searching, at grade level, the DCI on the [NGSS website](#). For your convenience we have listed the Science and Engineering Practices below, most projects will address all of these practices.

Common Core State Mathematics Standards

Several of the Sustainable Development Goals don't align well with the NGSS Disciplinary Core Ideas so we have added additional connections for these goals to the Common Core Math standards. The math connections provide clarity and not only stress conceptual understanding of key ideas, but also continually return to organize principles.

Science and Engineering Practices

1. Asking Questions and Defining Problems
2. Developing and Using Models
3. Planning and Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics and Computational Thinking
6. Constructing Explanations and Designing Solutions
7. Engaging in Argument From Evidence
8. Obtaining, Evaluating, and Communicating Information

Sustainable Development Goal	Disciplinary Core Ideas (DCI's)	Crosscutting Concepts	Common Core Math Connections
<p>1: No Poverty</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 1.1: Eradicate extreme poverty for all people everywhere, currently \$1.25/day. ● 1.4: Ensure that all men and women, in particular the poor and the vulnerable, have equal economic resources, as well as access to basic services. ● 1.5: Build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters. 	<p>LS2.C Ecosystems – Interactions, Energy and Dynamics: The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health.</p> <p>LS4.D: Biodiversity and Humans – Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on – for example, water purification and recycling.</p>	<p>Stability and Change: Small changes in one part of a system might cause large changes in another part.</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World: The use of technologies and any limitations on their use are driven by individual or societal needs, desires and values: by the findings of scientific research; and by the differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region over time.</p>	<p><u>CCSS.MATH.CONTENT.6.RP.A.3</u></p> <p>Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</p> <p><u>CCSS.MATH.CONTENT.6.EE.C.9</u></p> <p>Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.</p>
<p>2: Zero Hunger</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 2.1: End hunger and ensure access by all people, in 	<p>LS1.C: Organization for Matter and Energy Flow in Organisms: Within individual organisms, food moves through a series of chemical reactions in which it is broken down and</p>	<p>Energy and Matter: The transfer of energy can be tracked as energy flows through a natural system.</p>	

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<p>particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year.</p> <ul style="list-style-type: none"> ● 2.3: Double the agricultural productivity and incomes of small-scale food producers, in particular women, through secure and equal access to land and other productive resources. ● 2.4: Ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production. 	<p>rearranged to form new molecules, to support growth, or to release energy.</p> <p>PS3.D: Energy in Chemical Processes and Everyday Life: Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.</p> <p>MS-LS2.B: Cycle of Matter and Energy Transfer in Ecosystems: Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem.</p>	<p>Energy and Matter: Matter is conserved because atoms are conserved in physical and chemical processes.</p> <p>Stability and Change: Small changes in one part of a system might cause large changes in another part.</p>	
<p>3: Good Health and Wellbeing</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 3.1: Reduce the global maternal mortality rate. ● 3.2: End preventable deaths of newborns and children under 5 years of age. 	<p>LS4.D: Biodiversity and Humans: Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on – for example, water purification and recycling.</p>	<p>Cause and Effect: Cause and effect relationships may be used to predict phenomena in natural or designed systems.</p>	<p><u>CCSS.MATH.CONTENT.7.EE.B.4</u></p> <p>Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p>

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<ul style="list-style-type: none"> ● 3.3: End the epidemic of communicable diseases ● 3.8: Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all. ● 3.9: Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination. 	<p>ESS3.A: Natural Resources – Humans depend on Earth’s land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.</p>	<p>Patterns: Patterns can be used to identify cause and effect relationships.</p> <p>Stability and Change: Small changes in one part of a system might cause large changes in another part.</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World: All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.</p>	<p><u>CCSS.MATH.CONTENT.8.EE.B.5</u></p> <p>Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</p>
<p>4: Quality Education</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 4.1: Ensure that all girls and boys complete free, equitable and quality primary and secondary education. ● 4.A: Build and upgrade education facilities that are child, disability and gender 	<p>LS4.D: Biodiversity and Humans: Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on – for example, water purification and recycling.</p>	<p>Patterns: Patterns can be used to identify cause and effect relationships.</p> <p>Stability and Change: Small changes in one part of a system might cause large changes in another part.</p>	<p><u>CCSS.MATH.CONTENT.5.G.A.1</u></p> <p>Graph points on the coordinate plane to solve real-world and mathematical problems.</p> <p><u>CCSS.MATH.CONTENT.6.SP.A.1</u></p>

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<p>sensitive and provide safe, nonviolent, inclusive and effective learning environments for all.</p> <ul style="list-style-type: none"> ● 4.2: Ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education. 		<p>Influence of Science, Engineering, and Technology on Society and the Natural World: The use of technologies and any limitations on their use are driven by individual or societal needs, desires and values: by the findings of scientific research; and by the differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region over time.</p>	<p>Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.</p> <p><u>CCSS.MATH.CONTENT.7.SP.A.1</u></p> <p>Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population.</p>
<p>5: Gender Equality</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 5.1: End all forms of discrimination against all women and girls everywhere. ● 5.5: Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life. ● 5.A: Undertake reforms to give women equal rights to 	<p>LS4.D: Biodiversity and Humans: Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on – for example, water purification and recycling.</p> <p>LS2.C Ecosystems – Interactions, Energy and Dynamics: The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.</p>	<p>Patterns: Patterns can be used to identify cause and effect relationships.</p> <p>Stability and Change: Small changes in one part of a system might cause large changes in another part.</p>	<p>CCSS.MATH.CONTENT.5.MD.A.1</p> <p>Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.</p> <p>CCSS.MATH.CONTENT.8.SP.A.4</p> <p>Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and</p>

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<p>economic resources, as well as access to ownership and control over land, financial services, inheritance and natural resources.</p> <ul style="list-style-type: none"> ● 5.B: Enhance the use of enabling technology, to promote the empowerment of women. 			<p>relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.</p>
<p>6: Clean Water and Sanitation</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 6.1: Achieve universal and equitable access to safe and affordable drinking water for all. ● 6.2: Achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those vulnerable situations. 	<p>LS1.A From Molecules to Organisms: Structures and Processes: Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range.</p> <p>LS4.D: Biodiversity and Humans: Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on – for example, water purification and recycling.</p>	<p>Cause and Effect: Cause and effect relationships may be used to predict phenomena in natural or designed systems.</p> <p>Patterns: Patterns can be used to identify cause and effect relationships.</p> <p>Stability and Change: Small changes in one part of a system might cause large changes in another part</p>	

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<ul style="list-style-type: none"> ● 6.3: Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater substantially increasing recycling and safe reuse globally. ● 6.B: Support and strengthen the participation of local communities in improving water and sanitation management. 	<p>PS1.B: Chemical Reactions: Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.</p>	<p>Influence of Science, Engineering, and Technology on Society and the Natural World: All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.</p>	
<p>7 Affordable and Clean Energy</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services. ● 7.2: Increase substantially the share of renewable energy in the global energy mix. ● 7.3: Double the global rate of improvement in energy efficiency 	<p>PS1.B: Chemical Reactions: Some chemical reactions release energy, others store energy.</p> <p>PS3.B Conservation of Energy and Energy Transfer: When the motion of an object changes there is inevitably some other change in energy at the same time.</p>	<p>Energy and Matter: The transfer of energy can be tracked as energy flows through a natural system.</p> <p>Stability and Change: Small changes in one part of a system might cause large changes in another part.</p>	

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<ul style="list-style-type: none"> ● 7.A: Enhance international cooperation to facilitate access to clean energy research and technology, including renewables. 	<p>LS1.C: Organization for matter and energy flow in organisms: Plants, algae, and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen.</p>	<p>Influence of Science, Engineering, and Technology on Society and the Natural World: All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.</p>	
<p>8 Decent Work and Economic Growth</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 8.1: Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 percent gross domestic product growth in least developed countries. ● 8.2: Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added sectors. 	<p>LS4.D: Biodiversity and Humans: Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on – for example, water purification and recycling.</p>	<p>Structure and Function: Structures can be designed to serve functions by taking into account properties of different materials, and how materials can be shaped and used.</p> <p>Stability and Change: Small changes in one part of a system might cause large changes in another part.</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World: The use of technologies and any limitations on their use are driven by individual or societal needs, desires and values: by the findings of scientific research; and by the differences in</p>	<p><u>CCSS.MATH.CONTENT.5.OA.B.3</u></p> <p>Analyze patterns and relationships: Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.</p> <p><u>CCSS.MATH.CONTENT.6.SP.A.1</u></p> <p>Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. <i>For example, "How old am I?" is not a statistical question, but "How old are the students</i></p>

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<ul style="list-style-type: none"> ● 8.5: Achieve full and productive employment for all women and men, including for young people and persons with disabilities, and equal pay. 		<p>such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region over time.</p>	<p><i>in my school?" is a statistical question because one anticipates variability in students' ages.</i></p>
<p>9 Industry, Innovation and Infrastructure</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 9.1: Develop quality, reliable, sustainable and resilient infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. ● 9.3: Increase access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets. ● 9.5: Enhance scientific research, upgrade the 	<p>ESS3.C: Human Impacts on Earth Systems: Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive).</p> <p>ESS3.D: Global Climate Change Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature.</p>	<p>Stability and Change: Small changes in one part of a system might cause large changes in another part.</p> <p>Patterns: Patterns can be used to identify cause and effect relationships.</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World: The use of technologies and any limitations on their use are driven by individual or societal needs, desires and values: by the findings of scientific research; and by the differences in such factors as climate, natural resources, and economic</p>	

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<p>technological capabilities of industrial sectors in all countries, in particular developing countries.</p>		<p>conditions. Thus technology use varies from region to region over time.</p>	
<p>10 Reduced Inequalities</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 10.1: By 2030, progressively achieve and sustain income growth of the bottom 40 % of the population at a rate higher than the national average. ● 10.2: Empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status. ● 10.3: Ensure equal opportunity and reduce inequalities of outcome. 	<p>LS4.D: Biodiversity and Humans: Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on – for example, water purification and recycling.</p> <p>MS-LS2.C Ecosystems – Interactions, Energy and Dynamics: The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health.</p>	<p>Analyzing and Interpreting Data: Quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis to provide evidence for phenomena.</p> <p>Engaging in Argument from Evidence: Engage in argument from evidence to construct a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).</p>	<p><u>CCSS.MATH.CONTENT.7.NS.A.3</u></p> <p>Solve real-world and mathematical problems involving the four operations with rational numbers.</p> <p><u>CCSS.MATH.CONTENT.8.EE.C.8.C</u></p> <p>Solve real-world and mathematical problems leading to two linear equations in two variables. <i>For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.</i></p>
<p>11 Sustainable Cities and Communities</p>	<p>ESS2.C: Human Impacts on Earth Systems: Human activities have</p>	<p>Stability and Change: Small changes in one part of a system</p>	

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<p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums. ● 11.2: Provide access to safe, affordable, accessible and sustainable transport systems for all. ● 11.3: Enhance inclusive and sustainable urbanization and capacity for sustainable human settlement planning and management in all countries. ● 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage. 	<p>significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive).</p> <p>ESS3.D: Global Climate Change Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature.</p>	<p>might cause large changes in another part.</p> <p>Patterns: Patterns can be used to identify cause and effect relationships.</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World: The use of technologies and any limitations on their use are driven by individual or societal needs, desires and values: by the findings of scientific research; and by the differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region over time.</p>	
<p>12 Responsible Consumption and Production</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 12.1: By 2030, achieve the sustainable management and efficient use of natural resources. 	<p>ESS3.C: Human Impacts on Earth Systems: Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive).</p>	<p>Systems and Systems Models: Models can be used to represent systems and their interactions - such as inputs, processes and outputs - and energy, matter, and information flows within systems.</p> <p>Stability and Change: Stability might be disturbed either by</p>	

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<ul style="list-style-type: none"> ● 12.3: Halve per capita global food waste at the retail and consumer levels. ● 12.5: Substantially reduce waste generation through prevention, reduction, recycling and reuse. 		sudden events or gradual changes that accumulate over time.	
<p>13 Climate Action</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 13.1: Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries. ● 13.2: Integrate climate change measures into national policies. ● 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. 	<p>ESS3.D: Global Climate Change Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature.</p> <p>ESS2.D: Weather and Climate: Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with location, which can affect oceanic and atmospheric flow patterns.</p>	<p>Cause and Effect: Cause and effect relationships may be used to predict phenomena in natural or designed systems.</p> <p>Systems and Systems Models: Models can be used to represent systems and their interactions - such as inputs, processes and outputs - and energy, matter, and information flows within systems.</p> <p>Stability and Change: Stability might be disturbed either by sudden events or gradual changes that accumulate over time.</p>	
<p>14 Life Below Water</p> <p>Key Target Areas:</p>	<p>ESS2.C: The Roles of Water in Earth's Surface Processes: Water continually cycles among land, ocean, and atmosphere via transpiration,</p>	<p>Energy and Matter: Within a natural or designed system, the</p>	

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<ul style="list-style-type: none"> ● 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution. ● 14.2: Sustainable manage and protect marine and coastal ecosystems to avoid significant adverse impacts. ● 14.3: Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels. ● 14.5: By 2020, conserve at least 10% of coastal and marine areas. 	<p>evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.</p> <p>ESS2.D: Weather and Climate: The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.</p> <p>LS2.C: Interdependent Relationships in Ecosystems: In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.</p>	<p>transfer of energy drives the motion and/or cycling of matter.</p> <p>Systems and Systems Models: Models can be used to represent systems and their interactions - such as inputs, processes and outputs - and energy, matter, and information flows within systems.</p> <p>Cause and Effect: Cause and effect relationships may be used to predict phenomena in natural or designed systems.</p>	
<p>15 Life on Land</p> <p>Key Target Areas:</p> <ul style="list-style-type: none"> ● 15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial 	<p>LS2.A: Interdependent Relationships in Ecosystems: In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which</p>	<p>Energy and Matter: Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.</p>	

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<p>and inland freshwater ecosystems.</p> <ul style="list-style-type: none"> ● 15.2: By 2020, promote the implementation of sustainable management of all types of forests. ● 15.5: Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and protect and prevent the extinction of threatened species. 	<p>consequently constrains their growth and reproduction.</p> <p>LS2.B: Cycle of Matter and Energy Transfer in Ecosystems: Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem.</p>	<p>Stability and Change: Stability might be disturbed either by sudden events or gradual changes that accumulate over time.</p> <p>Systems and Systems Models: Models can be used to represent systems and their interactions - such as inputs, processes and outputs - and energy, matter, and information flows within systems.</p>	