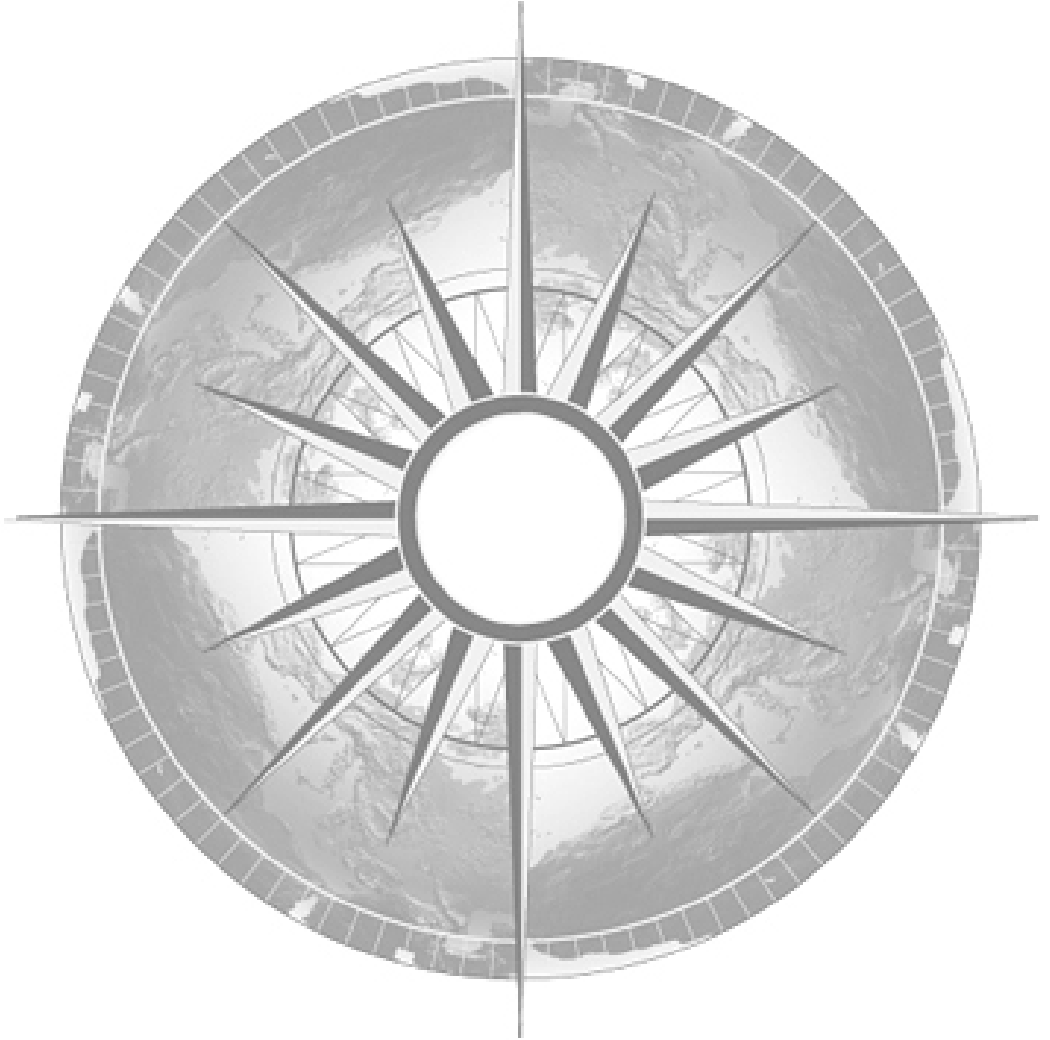


Hemispheres

People and Place Curriculum Resources on Human-Environmental Interactions

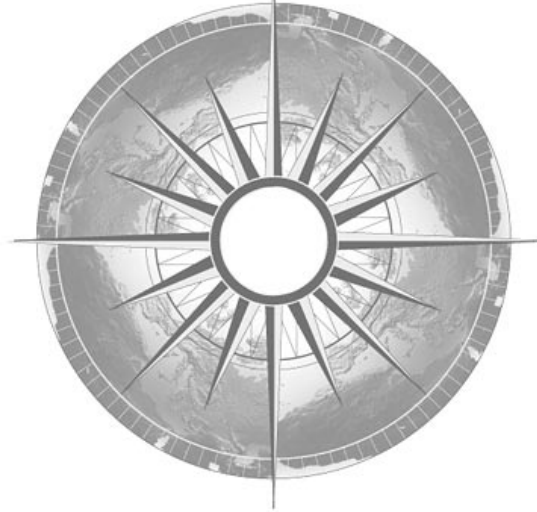


Hemispheres is a joint project of:
Teresa Lozano Long Institute of Latin American Studies
Center for Middle Eastern Studies
Center for Russian, East European & Eurasian Studies
South Asia Institute

in the College of Liberal Arts
at The University of Texas at Austin

People and Place

Curriculum Resources on
Human-Environmental Interactions



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People and Place
Curriculum Resources on
Human-Environmental Interactions

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TEACHER NOTES

GOALS

This case study will help students understand the challenges of life in the Himalayas, the Earth's highest mountain system. People living in the Himalayas must think carefully about how to use the limited natural resources around them. This case study will examine the finite nature of the water supply, and sunlight as an energy source. Your students will understand that: (1) geographic location, natural resource availability, and lifestyle are interwoven; (2) making use of natural resources does not need to be technologically complicated, but can rely instead on local knowledge and ingenuity; and (3) our lifestyle choices affect the environment both locally and globally. Students will work with readings, maps, charts, and graphs in order to develop geographic skills.

ASSESSMENT EVIDENCE

GRASP : Students will create a presentation for a city official promoting either composting toilets or passive solar heating systems, and will support their presentation by creating a poster board with charts, graphs, and text based on information presented in the case study.

LEARNING ACTIVITIES

- The *Everything Is Connected* activity introduces the idea of a cold desert microclimate to your students. Students brainstorm about what a cold desert is and the effect this environment has on the human population that lives there.
- The *Leh, India: Planning Household Services* section of this case study includes a series of questions that require students to learn about the geographic features of their hometown. By comparing six factors of their hometown to the township in the case study (Leh), the students think about how life in Leh is different from that in their hometown. An Internet search, librarian, or Tourist Bureau can help find the answers needed for your hometown.
- *Understanding and Interpreting Graphic Information* has your students interpret information from a variety of nonnarrative sources, including maps, tables, and charts.
- *Water Use Audit* is a multi-step activity including both group and individual work. This activity allows students to begin to understand how their lifestyles affect the water supply. The whole-class graph activity helps students to conceptualize the impact society has on the natural environment.
- In *Why Dry Toilets?*, students use the readings, charts, and photos to assess why the city of Leh would decide to use dry composting toilets in the new settlement.
- *Solar Energy's Importance* briefly explains sunlight as solar energy, renewable versus nonrenewable energy, passive and active solar heating. The two photos following the reading help illustrate how passive solar heating will be used in Leh.
- *Thinking about Solar Energy* is composed of two exercises. *Reading—Reflecting—Writing* will have your students support a passive solar heating design. *Essential Questions* is a reflection exercise that can be handled in a variety of ways such as graded writing, journaling, group discussion, controlled debate, or test questions. In answering these questions, students will demonstrate knowledge gained, internalization of the topic, skill in interpreting information from a variety of sources, and geographic understanding of natural resources and energy consumption.

Source: Much of the information for this case study came from a presentation at Hemispheres' 2004 Summer Teachers' Institute, *People and Place: Human-Geographic Relations*. Information found elsewhere has been cited.

Everything Is Connected

“Everything is connected to everything else” is often called the First Law of Ecology. This activity encourages your students to consider the connections between aspects of our natural environment and human society.

Word Web:

- (1) Project a color image of Ladakh (below) on an overhead or LCD projector.
- (2) Write the words “Cold Desert” in the middle of the chalkboard. Tell students that you want them to think of possible environmental and social consequences of living in a cold desert. You may want to provide an example such as: “cold desert” . . . might mean “cold temperatures,” which may lead to “indoor community activities.” Be sure to tell students that there are no right or wrong answers, but you may want them to explain their proposed connections. They need to understand that the cause-and-effect relationship can be positive, negative, or neutral.
- (3) Build the word map on the board. You can invite students up to the board to add onto the central concept or to build upon someone else’s ideas. For each concept that is added, arrows should be used to show a cause-and-effect relationship.
- (4) After all students have contributed to the word web, walk them through it starting from the middle. You may wish to ask individual students to explain their additions and see if others in the class agree or disagree.



Leh, India: Planning Household Services

Leh is a city in the Ladakh region (a county) in the state of Jammu and Kashmir in India. Leh is 11,000 feet above sea level and has a longitude of 34.17 degrees. Due to heavy snowfall, the roads in and around Leh are closed from October to April. This area is a microclimate called a cold desert.

Ladakh is a cold desert for three reasons:

- It has an annual rainfall of less than 110 mm (4.33 inches).
- It has clear sunshine for over 300 days each year.
- The average summer temperature is 70° F; the average winter temperatures is -4° F.

How different (or similar) is this from/to your hometown?

My hometown is _____ feet above sea level.

My hometown's longitude is _____ degrees.

My hometown has _____ days of sunshine each year.

My hometown has an average summer temperature of _____.

My hometown has an average winter temperature of _____.

The annual rainfall in my hometown is _____.

The population of Leh is as large as it can get; there aren't enough houses for all the people who want to live there. City planners have to build a new settlement. They want the new settlement to meet the needs of the citizens, but they are also very concerned with conserving resources.

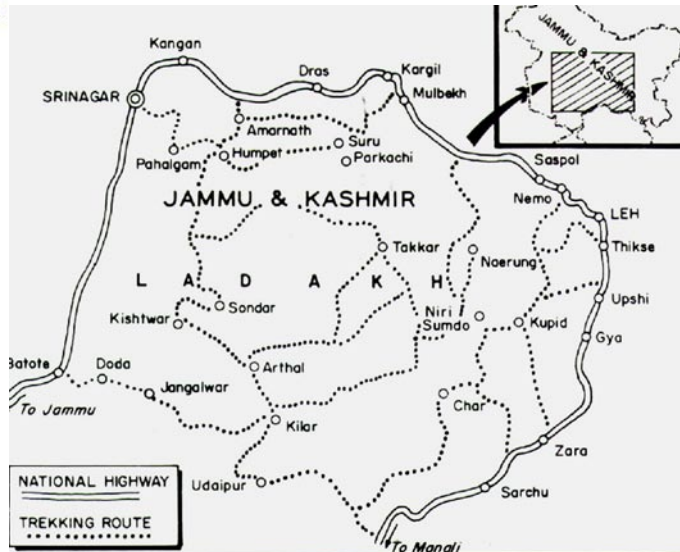
Because of the minimal rainfall each year, water is scarce. Leh's residents have developed ways to conserve water by sharing. For example, most houses in Leh do not have running water. People use water from wells in their neighborhoods. Also, 90% of the people do not have toilets in their homes. Instead they have communal, non-composting pit toilets. Because of the bad smell, these toilets are built far away from people's houses.

In the new settlement, city planners want to design houses that have dry composting, indoor toilets. A dry composting toilet is different from the typical toilet in the United States in two ways:

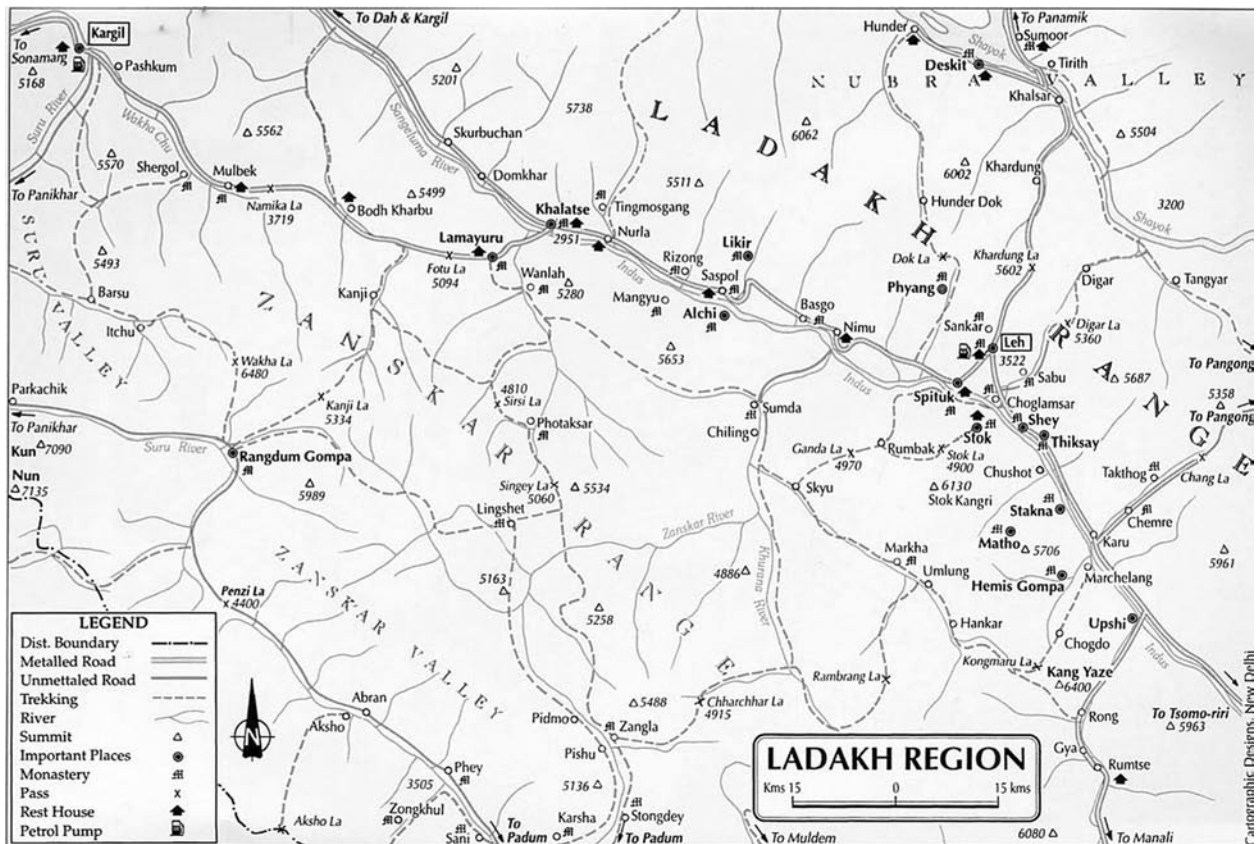
- It does not use water. Instead it has a vertical pipe so the waste falls straight down. It does not need water to push the waste through the pipe.
- It does not create pollution. The waste is collected in a composting chamber that has air vents and in 6 months is turned into dry odorless fertilizer.

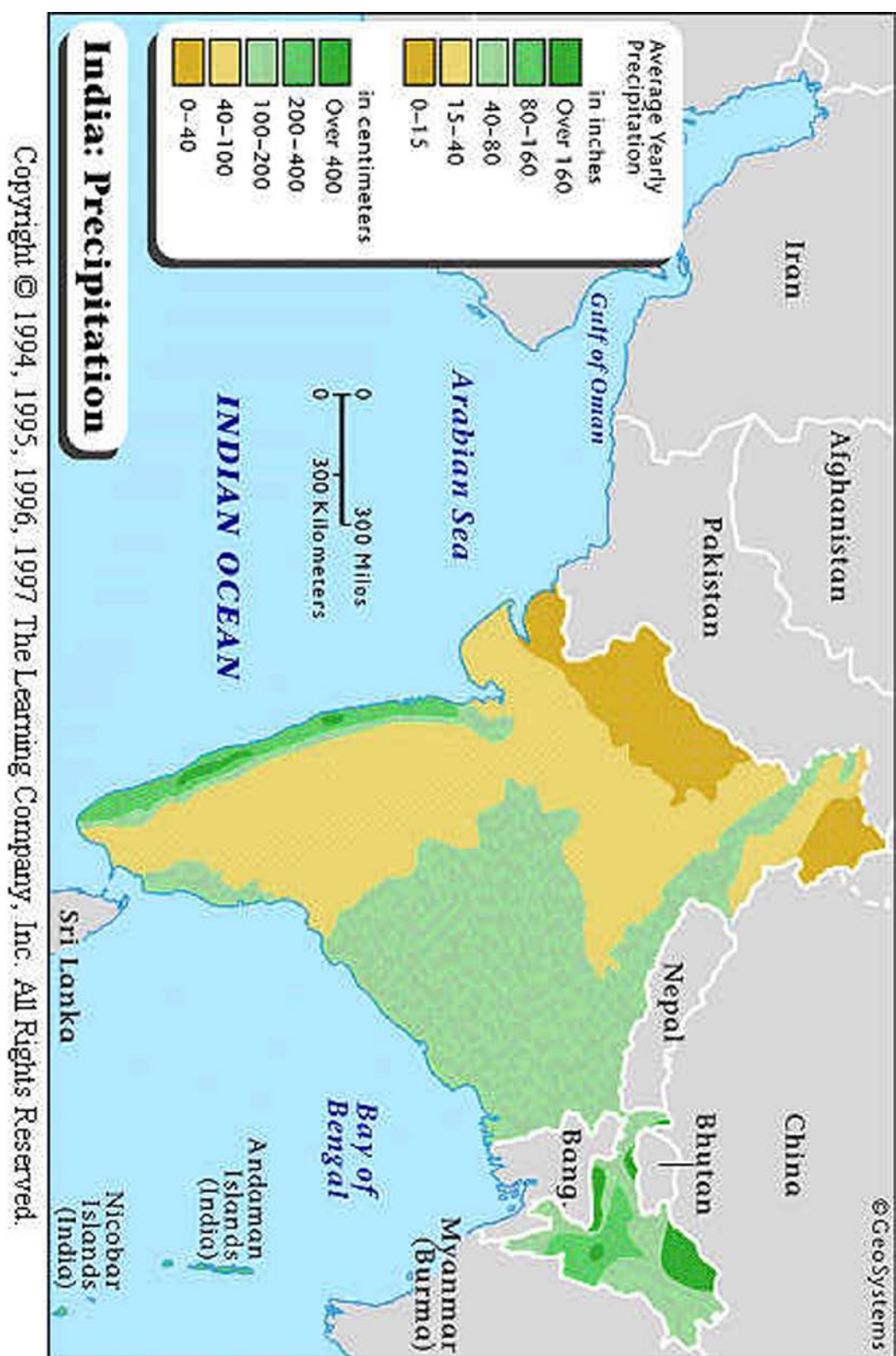
Leh does receive plenty of sunlight, and new construction in Leh has been planned to harness the power of the sun. Simple solar technologies, based on passive solar concepts (e.g., putting a building in the best position to get the most sun during the day) and using local material, can be tools to create new economic activities during the winter, such as greenhouses, poultry farming, and handicraft development, or during the summer, such as solar dryers for drying and preserving fruit.

Class Discussion Question: How have city planners used Leh's geographical situation to plan the new settlement?



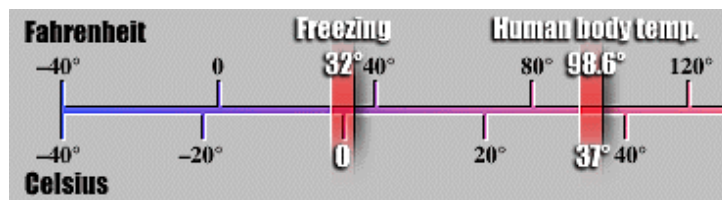
Can you locate Leh on the map below?





Four Indian Cities: Temperature and Rainfall

Temperature and Rainfall Data of Selected Stations													
Months													
Station		J	F	M	A	M	J	J	A	S	O	N	D
Leh	T°C	-8.5	-7.2	-0.6	6.1	10.0	14.4	17.2	16.1	12.2	6.1	0.0	-5.6
	R	10	0.8	0.8	0.5	0.5	0.5	1.3	1.3	0.8	0.5	-	0.5
	cm												
Delhi	T°C	14.4	16.7	23.3	30.0	33.3	33.3	30.0	29.4	28.9	25.6	19.4	15.6
	R	2.5	1.5	1.3	1.0	1.8	7.4	19.3	17.8	11.9	1.3	0.2	1.0
	cm												
Mumbai	T°C	24.4	24.4	26.7	28.3	30.0	28.9	27.2	27.2	27.2	27.8	27.2	25.0
	R	0.2	0.2	-	-	1.8	50.6	61.0	36.9	26.9	4.8	1.0	-
	cm												
Chennai	T°C	24.5	25.7	27.7	30.4	33.0	32.5	31.0	30.2	29.8	28.0	25.9	24.7
	R	4.6	1.3	1.3	1.8	3.8	4.5	8.7	11.3	11.9	30.6	35.0	13.9
	cm												
T = Mean monthly temperature in °C													
R = Average monthly rainfall in cms													



Use the scale above to compare temperatures in Celsius with those in Fahrenheit.

Sources: Indiatimes Learning, http://learning.indiatimes.com/test_papers/papers/geography/2000/set1a1_a12.htm; scale: USA Today.

Name: _____

Understanding and Interpreting Graphic Information

A. Look at the *India: Precipitation* map. Locate and label Leh, Delhi, Mumbai, and Chennai on the map.

- (1) Which city gets the most rain? Which city gets the least?
- (2) What is the annual rainfall in Leh in centimeters? How does that compare to your hometown?
- (3) Do you think that the small amount of rainfall in Leh affects how people live their daily lives? Why or why not?

B. Look at the *Four Indian Cities* table.

- (1) Which city gets the most rainfall in one month?
- (2) Which city has the lowest temperature of the year?
- (3) Which city has the most variable temperature? Which has the most stable temperature?
- (4) Figure out the average of the monthly temperatures (in Celsius) of
 - (a) Leh:
 - (b) Delhi:
 - (c) Mumbai:
 - (d) Chennai:
- (5) Based on the rain and temperature information on Leh, do you think Leh would be a pleasant place to live? Why or why not?

Water Use Audit

- (1) Have students record how many gallons of water they think they use individually in an average day.
- (2) As a group, have them list all the ways members of their class use water on a day-to-day basis.
- (3) Put up the overhead “Water, Water, Everywhere.” Using the data in the “Domestic Uses of Water” part of the table, have them determine their individual water use per day for each activity that they listed in step 2.
- (4) Students should compare their individual water use calculated in Step 3 with the water use estimated in Step 1.
- (5) Students should draw a bar graph to illustrate how much water is used by their class for each activity.
- (6) To complete the activity, have a class discussion on how water usage should change if your hometown were to experience a drought. What are the first things students would limit? How much would they have to change their lifestyles if your hometown got as little rainfall as Leh?

WATER, WATER, EVERYWHERE

Student Information Sheet

DOMESTIC USES OF WATER

Activity	Gallons Used
Brushing teeth	2-10
Washing hands	2
Shaving.....	20 (2/min.)
Showering	20-25 (5/min.)
Tub bathing	25-35
Flushing toilet	3.5-8
Getting a drink.....	0.25
Cooking a meal	5-7
Washing dishes by hand	30 (8-10/meal)
Automatic dishwasher	15
House cleaning.....	7
Washing machine.....	24-50
Watering lawn	10/min.
Leaky faucet	25-50/day
Faucet and toilet leaks in New York City	757 million gallons/day

INDIRECT USES OF WATER

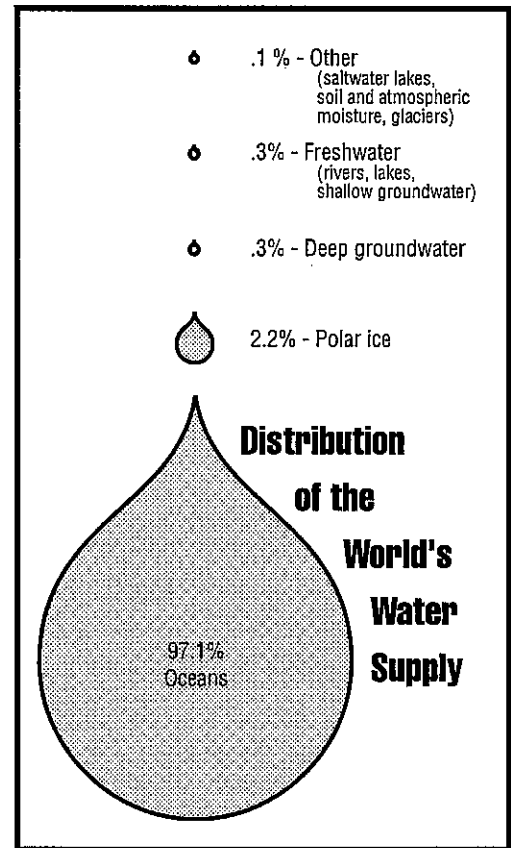
Agricultural

Item	Gallons Used
1 egg	40
1 orange	100
1 ear of corn	76
1 loaf of bread.....	142
1 kg flour	165
1 kg sugar.....	275
1 kg rice	1,101
1 kg beef	5,507

Industrial

Item	Gallons Used
Industrial mining/manufacturing	183/person/day
Cooling water for electric power plants	700/person/day
1 gallon gasoline	26-95
1 kg steel	77
Sunday newspaper	280
1 kg synthetic rubber.....	660
1 kg aluminum.....	2,202
1 car	94,825

Figure 1



From *Living in the Environment*, Third Ed., by G. Tyler Miller, Jr. © 1982 Wadsworth, Inc.

Why Dry Toilets?

Looking at the chart and photos below, and thinking about what you've already read, you should discuss why the city of Leh might decide to install dry composting toilets. As a class, list at least 5 reasons why dry composting toilets are the best option for the residents of Leh.

	FLUSH TOILETS	EXISTING PIT TOILETS	DRY COMPOSTING TOILETS
COST	\$100 - \$700	No Cost	\$2,000
CONSTRUCTION NEEDS	Pipes and insulation	Rocks, masonry, lumber	Pipes, glazing, compost tank
WATER USE	6 gallons	No water used	No water used
SMELL	No smell	Bad smell	No smell
LOCATION	Inside	Outside	Inside
ENVIRONMENTAL IMPACT	Raw sewage and methane gases	Raw sewage and methane gases	Usable, odorless compost

Existing Pit Toilets in Leh

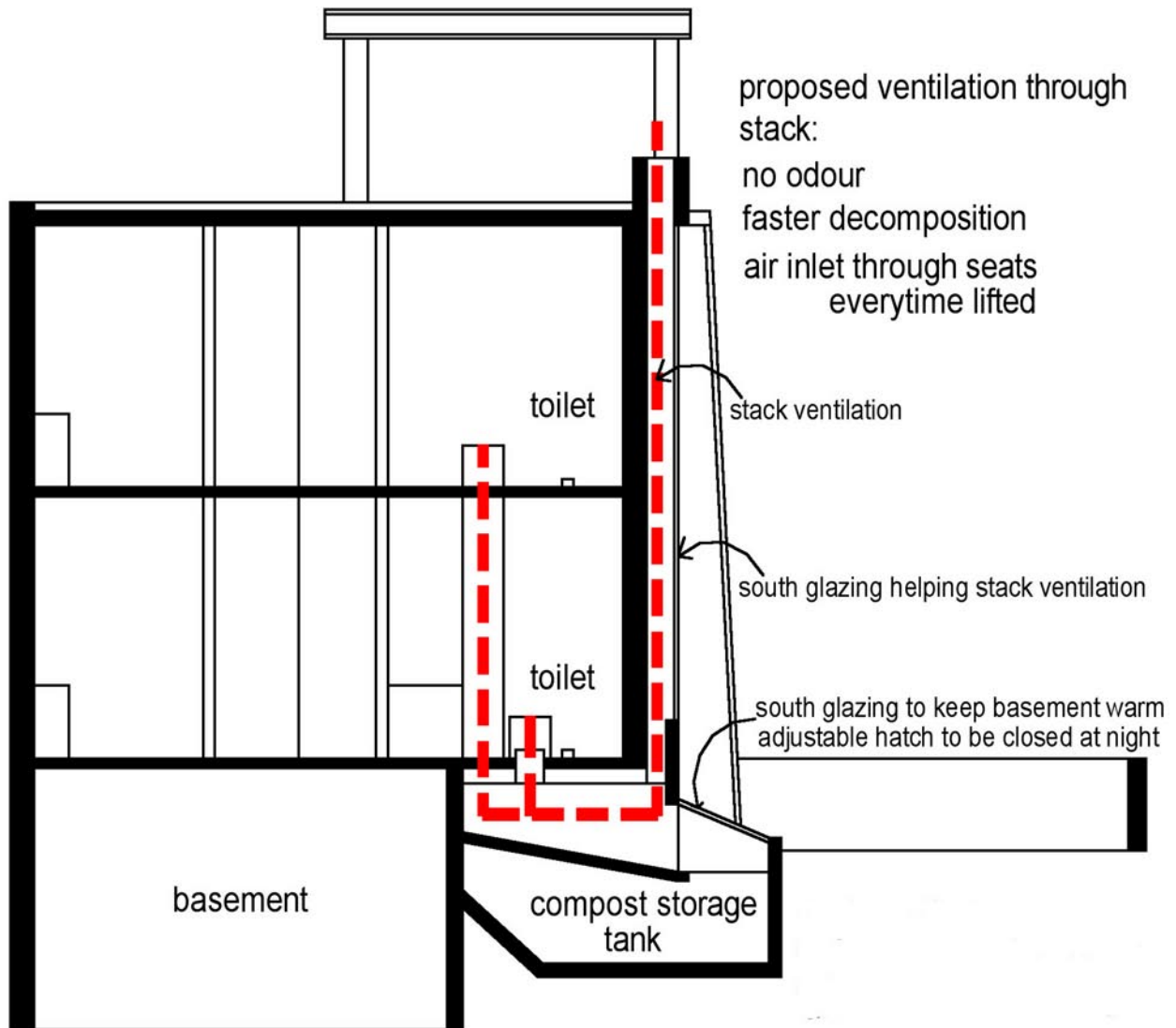


dry composting toilet

placed on south side

easy removal of compost as access through south yard of each house

seats on both levels staggered for use of one composting storage tank



Solar Energy's Importance

With the exception of nuclear, geothermal, and tidal energy, all forms of energy used on earth originate from the sun's energy. Some are renewable, some are not. Renewable refers to energy that can be regenerated, or renewed, in a relatively short amount of time. The energy contained in fossil fuels—coal, oil, and natural gas—also comes from the sun's energy, but it was stored in plants millions of years ago, and once it has been used, it cannot be regenerated on a human timescale.

For thousands of years, the sun's renewable energy was humanity's sole source of energy. Its role started to decrease only a few centuries ago, with the progress of industrialization, new technologies, and the discovery of new fossil fuels (coal has been used since ancient times) and nuclear power. Today solar sources provide around 10% of the energy used worldwide. Most of the energy we use goes into heating, cooling, and lighting buildings and into running the devices used in buildings.

Solar space heating systems can be passive or active. In passive heating systems, the air is circulated without the use of mechanical equipment. In active heating systems, fans and pumps are used to circulate the air or the heat absorbing fluid.

According to the International Energy Agency, 68% of the increase in energy demand between 1997 and 2020 will come from developing countries. Developing countries have twice the annual increase of energy needs than countries that are considered industrialized. Right now, most of the energy we consume comes from solar energy stored as fossil fuels. Each year, the earth receives the equivalent of 19 trillion toe (ton of oil equivalent) of solar radiation, which is the flow of renewable solar energy the earth receives from the sun. The energy requirement of the world, right now, is 9 billion toe. There are enough remaining fossil fuels to provide energy at today's rate of consumption for another 500 years.

India receives the solar energy equivalent of over 5,000 trillion kWh (kilowatt hours) each year, which is far more than the total energy consumption of the country. In the United States, the total electricity consumption is just under 4,000 kWh each year. India represents perhaps the largest solar market in the world, with a population of 850 million, of which 40% have no electricity.

Passive Solar Energy

Building design can help harness the power of the sun to heat and cool the building. When the sun shines on a building, the materials used to construct the building can reflect, transmit, or absorb the sun's heat. Also, the heat produced by the sun causes the air to move in a predictable way (i.e., less dense warm air tends to rise, while more dense cooler air moves downward), making it easier to distribute heat throughout a room or building.

Architects can use a few easy rules to design buildings to utilize passive solar energy, including making sure that the longest side of the building gets the most sunlight; that one side of the building gets direct sunlight during the warmest parts of the day; and that rooms that need the most light and heat should face the side receiving the most sunlight.

Passive solar information adapted from: *A Sourcebook for Green and Sustainable Building*, <http://www.green-builder.com/sourcebook/PassSolGuide1-2.html>

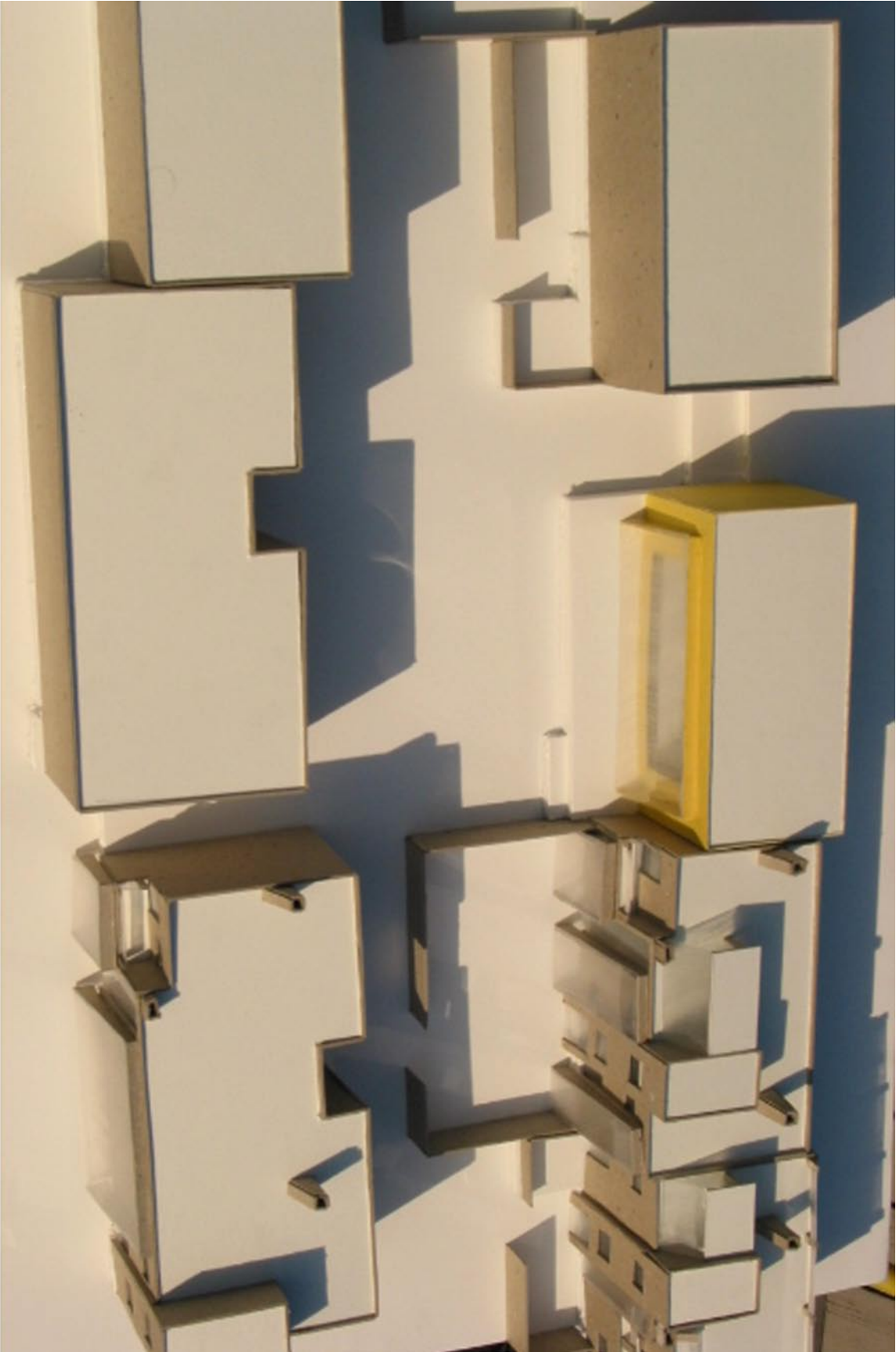
Existing Street in Leh

What do you notice about the street and the sunlight?



Architect's Model of Passive Solar Street in New Settlement

How does this picture differ from the existing street?



Thinking about Passive Solar Energy

Reading—Reflecting—Writing

Write a paragraph about why houses in the new areas of Leh should be built using passive solar technology. Think about the climate and energy needs. Support your idea using information from the readings, maps, charts, and photographs.

Essential Questions

The following six questions help students think more deeply about this topic.

(1) Explanation

How would you explain solar energy to a first grader?

(2) Application

What would be the benefit to having your school use passive solar heating?

(3) Interpretation

If your home or school used passive solar energy, what message would it send to the community?

(4) Perspective

What world regions (or states in the United States) would not be suitable for passive solar heating? Explain your answer.

(5) Self Knowledge

What things, if any, in your life are renewable resources?

(6) Empathy

How would your life be different if you lived in a very cold climate without access to electricity? How would passive solar heating change your life?

Essential Questions modified from: Grant Wiggins & Jay McTighe. 1999. *Understanding by Design*. Alexandria, VA: Association for Supervision and Curriculum Development. 119.

GRASP

In small groups, students will design presentations using the information provided in the readings, maps, charts, graphs, and photographs provided in this unit. If time permits, students may do additional Internet research on their chosen option in order to make a more convincing argument.

Goal

- To choose the household service that will best utilize the available natural resources and will most benefit the people of Leh.

Role

- You are on a team of city planners who must recommend which new household system will work best for Leh.

Audience

- The key audience is the Mayor of Leh, who will make the final decision. Your advice will help the mayor evaluate the benefits of each option.

Situation

- Due to budget restrictions in Leh, the city can only afford to install one new resource-saving system—dry composting toilets or passive solar heating. It is your job to decide which will be most useful to the people of Leh.

Product

- You will need to create a poster board with a graph, chart, and/or text to advocate for the household service you have chosen. Use as much information from this case study as possible in making your argument. You will make a group decision about what information to present and what graphics you will create to illustrate your ideas.

Standards for Success

- Your group presentation must have a colorful graphic, must have clear and factual information, and each person must contribute to the project.

About Hemispheres

Created in 1996, Hemispheres is the international outreach consortium at the University of Texas at Austin. Hemispheres utilizes University resources to promote and assist with world studies education for K-12 and postsecondary schools, businesses, civic and non-profit organizations, the media, governmental agencies, and the general public.

Comprised of UT's four federally funded National Resource Centers (NRCs) dedicated to the study and teaching of Latin America; the Middle East; Russia, East Europe & Eurasia; and South Asia, Hemispheres offers a variety of free and low-cost services to these groups and more. Each center coordinates its own outreach programming, including management of its lending library, speakers bureau, public lectures, and conferences, all of which are reinforced by collaborative promotion of our resources to an ever-widening audience in the educational community and beyond.

Hemispheres fulfills its mission through: coordination of pre-service and in-service training and resource workshops for educators; promotion of outreach resources and activities via exhibits and presentations at appropriate state- and nation-wide educator conferences; participation in public outreach events as organized by the consortium as well as by other organizations; and consultation on appropriate methods for implementing world studies content in school, business, and community initiatives.

For more information, visit the Hemispheres Web site at:
<http://www.utexas.edu/cola/orgs/hemispheres/>
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