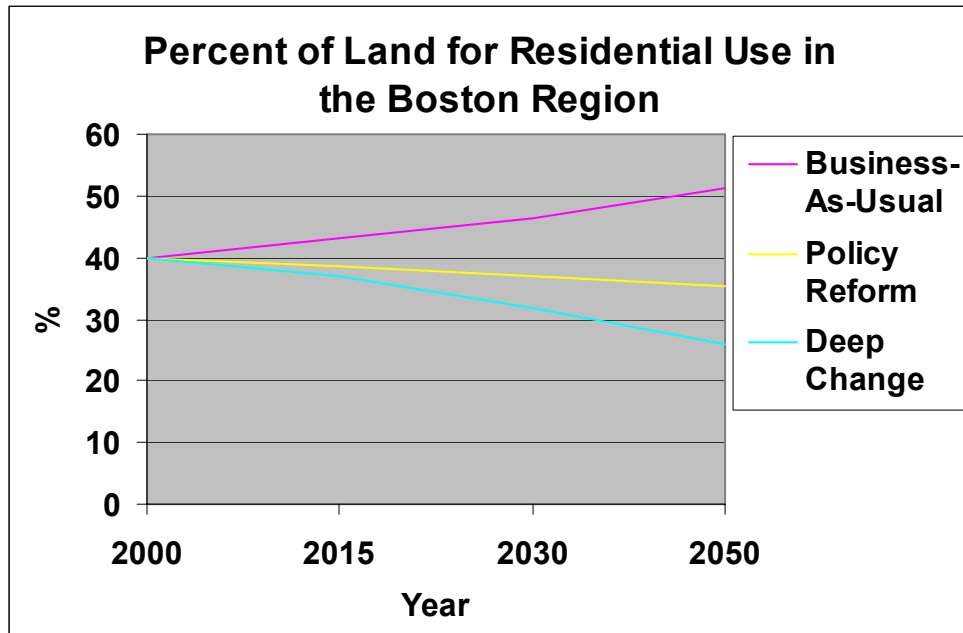


## The Built Environment



Source: Exported from PoleStar/Boston Metro 1<sup>st</sup> Order Scenarios

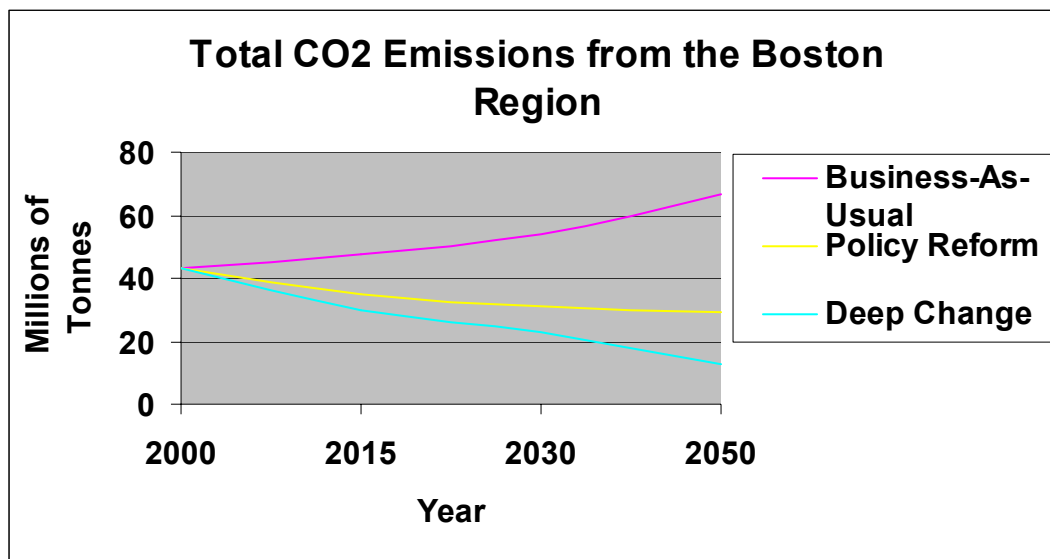
### Explanation:

In the Business-As-Usual scenario, the percentage of land for residential use increases from 40 to 51% of total land use in the Boston region. Based on MAPC projections, all scenarios assume a modest population increase in the region through 2050 (about .14% per year), so one can attribute part of this increase in land use to sprawl and a growing preference for larger houses.

In the Policy Reform scenario, land use decreases slightly to 35% due to better city planning curbing sprawl and promoting mixed-use development.

The Deep Change scenario witnesses a decline in residential land use to 26% of total land use. Contributing factors include updated zoning laws that encourage appropriate density levels and mixed-use development, higher density housing near transit hubs, and a shift in lifestyle towards a preference for smaller houses in more compact neighborhoods.

## Transportation and Land Use



Source: Exported from PoleStar/Boston Metro 1<sup>st</sup> Order Scenarios

### Explanation:

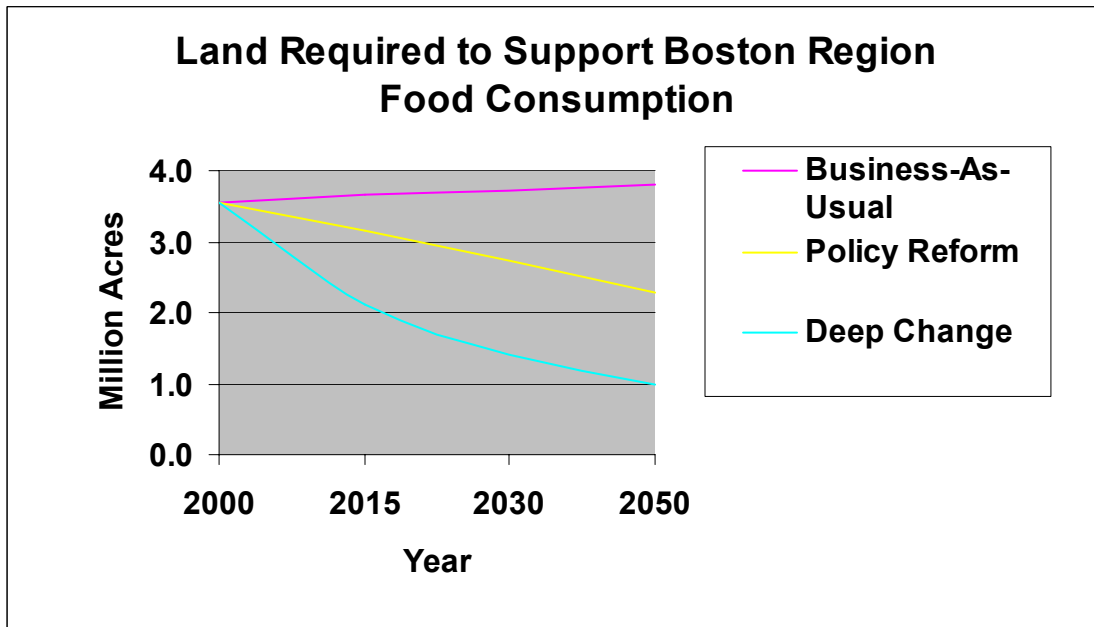
In 2000 the Boston region emitted 43.33 million tonnes of Carbon Dioxide. Electricity production accounted for 37% of these emissions, transport for 32%, households for 19%, services for 7%, and industry for 5%.

In the next 50 years, these emissions are expected to rise over 50% to about 66.7 million tonnes in the Business-As-Usual scenario, largely driven by economic growth, with some improvements in energy efficiency through changes in technology.

The Policy Reform scenario includes aggressive technology and policy initiatives to shift from fossil fuels to renewables and to reduce overall energy use through more cogeneration, significantly more efficient devices and vehicles, and adoption of some hydrogen-powered applications. These improvements reduce CO2 emissions by about 33% to just over 29 million tonnes.

The Deep Change scenario has all the technology and policy initiatives of the Policy Reform scenario, but also includes significant lifestyle changes involving smaller, more compact houses, increased density in developed areas, reduced travel in all modes including cars and airplanes, shorter work weeks, and reduced overall GDP growth which reduces energy demand in industry and services. As a result, by 2050 emissions are reduced to about 13 million tonnes or roughly 70% below 2000 levels.

## Agriculture #1



Source: Exported from PoleStar/Boston Metro 1<sup>st</sup> Order Scenarios

### Explanation:

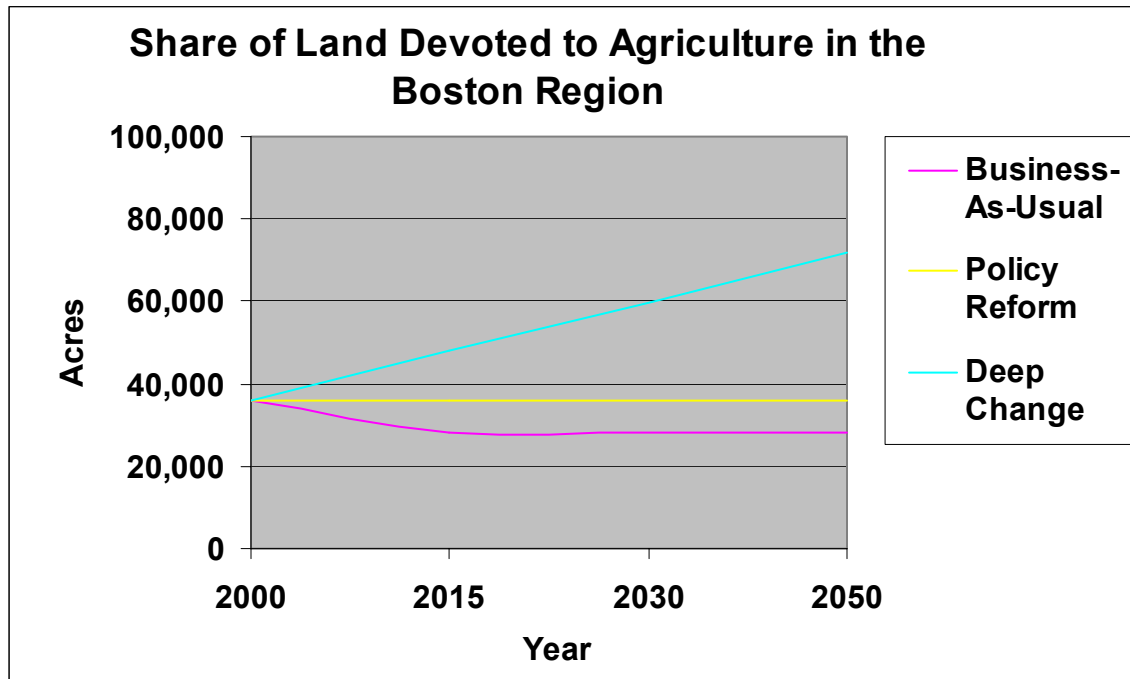
In 2000, the food consumed by people in the Boston region required roughly 3.54 million acres of farmland (including food crops and the feed required to support meat and poultry). This was the equivalent of nearly 4 times the total land area of the MAPC region. Obviously, the vast majority of the land providing food for the Boston area is outside the region.

In the Business-As-Usual scenario, we assume no change in diet and no further improvement in agricultural productivity. The land area required to support the region's food consumption will be close to 3.8 million acres by 2050. Average food crop yields have improved in the US at the rate of about 1.5% per year over the past 30 years. These trends have been flattening in recent years, however, and we do not expect evolutionary technological improvements in the BAU case to improve yields further over the next 50 years.

In the Policy Reform scenario, we assume that technical improvements in farming methods improve the productivity of land at the rate of about 1% per year. This causes the land area required to be reduced about 35% to about 2.3 million acres by 2050.

In the Deep Change scenario, a significant shift towards vegetarianism and a reduction in calorie intake towards the USDA recommended level of 2000 calories per day accompany the productivity improvements of the Policy Reform scenario. As a result, the land area required is reduced by about 72% to about 1 million acres, which is only about 10% larger than the size of the MAPC region.

## Agriculture #2



Source: Exported from PoleStar/Boston Metro 1<sup>st</sup> Order Scenarios

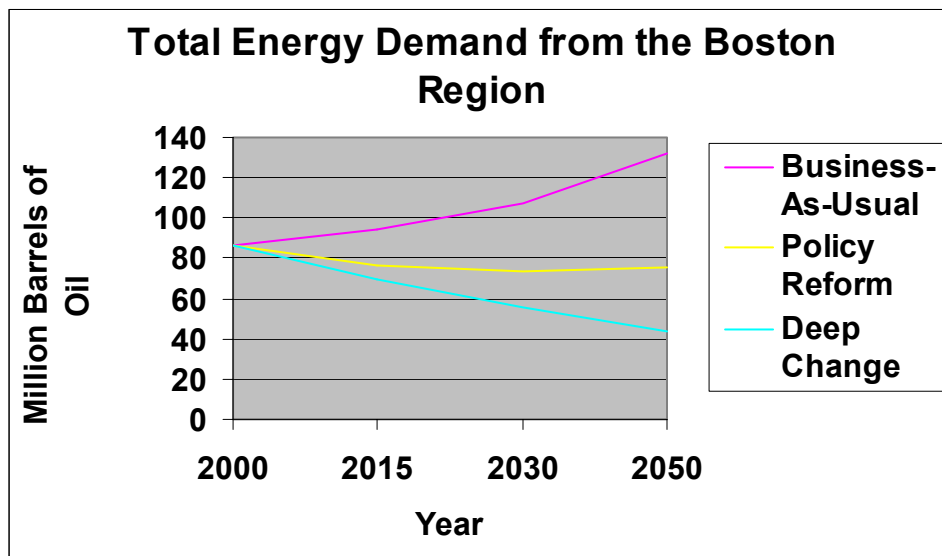
### Explanation:

While the global land area required for food production will increase in the Business-As-Usual scenario, land for agricultural production in the Boston area will decrease by 22% as the region continues to import the vast majority of its food and devote agricultural space to residential, commercial and industrial purposes.

In the Policy Reform scenario, we assume no change in the current 4% share of local land used for agriculture. In this scenario, there is no attempt to import less food into the region, yet residential land uses are constrained in favor of higher density, transit-oriented residential areas. The global land area employed for agriculture will in fact decrease, as more efficient technologies are used to achieve productivity increases of approximately 1% per year.

In the Deep Change scenario, land use for agriculture in the region doubles from 2000 levels, utilizing approximately 80,000 acres in the Boston region for food production, offering fresh, local, organic produce to residents. This represents a significant shift towards decreasing food imports and miles traveled for food products. While Boston will still import the majority of its residents' food, most imports will travel under 500 miles, rather than the current average of 1300 miles. Furthermore, the increased production of local food will be in line with a shift in diet towards vegetarianism and reduced calorific intake, making local food production a more feasible and preferable option.

## Energy



Source: Exported from PoleStar/Boston Metro 1<sup>st</sup> Order Scenarios

### **Explanation:**

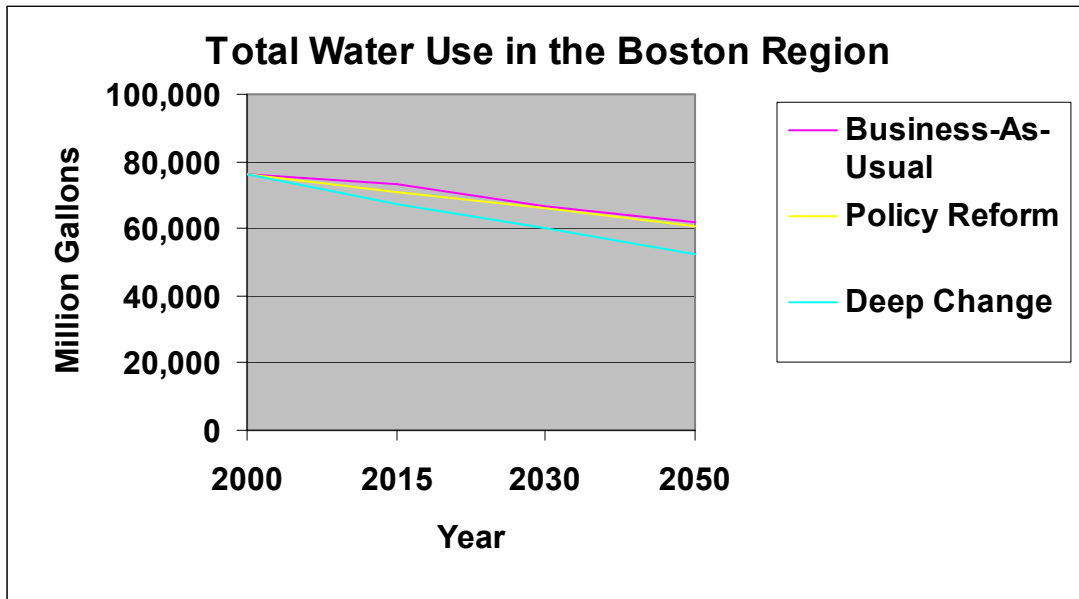
Two aspects of energy demand are important to consider: overall demand and the sources used to meet this demand. Both absolute reductions in energy demand as well as shifts to renewable and low-carbon sources can impact natural resource stocks as well as pollution levels, including greenhouse gas emissions.

In the Business-As-Usual scenario, Boston residents continue along the path of unabated energy consumption as energy-use levels reach 132 million barrels of oil in the year 2050. Household consumption levels of material products — including large cars and increasing numbers of new electric appliances — and levels of greenhouse gas emissions soar. The vast majority of energy is still derived from fossil fuels with only modest increases in the contribution from renewable sources.

In the Policy Reform scenario, overall consumption of fossil fuels is significant, but due to policy efforts to make cars and energy-consuming devices more efficient, total energy use declines by 12% from 2000 levels. In addition, a greater fraction of overall energy production comes from renewables.

In the Deep Change scenario, renewables now account for almost half of electricity generated and the green building movement has resulted in far more efficient buildings, often employing passive and active solar lighting and heating. Most importantly, value and lifestyle changes at the household level have led to greater consciousness about energy and other resource use, which is evident in smaller houses, more compact mixed-use developments, fewer appliances, and a shift to a higher use of public transit, alternative fuel vehicles, and less personal travel. These changes have contributed to a 50% overall reduction in energy use.

## Water



Source: Exported from PoleStar/Boston Metro 1<sup>st</sup> Order Scenarios

### Explanation:

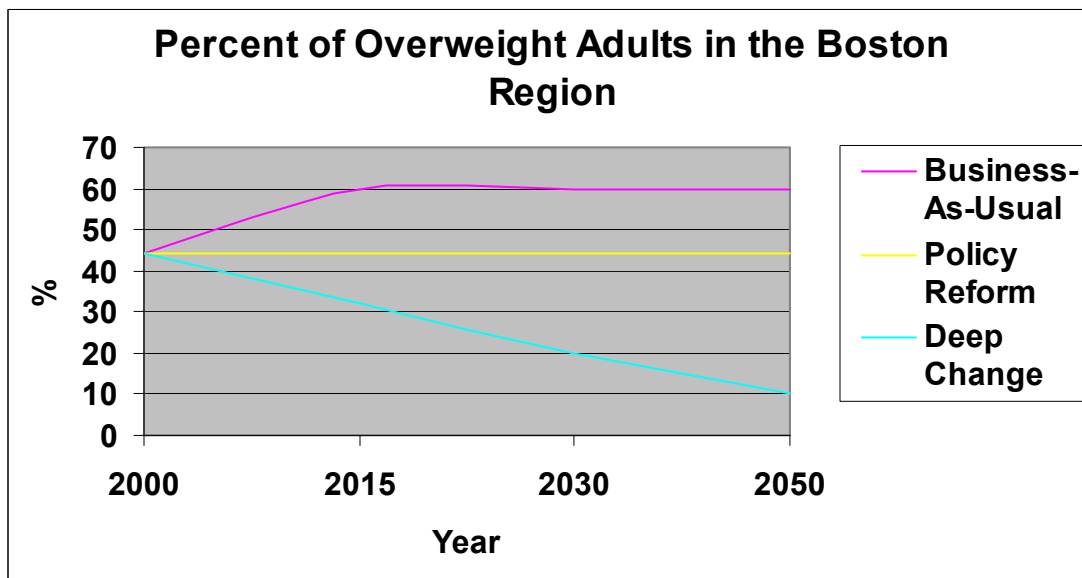
Consistent with trends over the past two decades, in all three scenarios, water use in the region declines.

In the Business-As-Usual scenario, water use declines by 19%, primarily due to increasing efficiencies of end-use technologies and continued progress in reducing leakage throughout the water delivery system.

In the Policy Reform scenario where reductions amount to 21%, these technologies are complimented by legislative conservation efforts that improve appliance efficiency standards and restore and protect watershed natural flow levels.

In the Deep Change scenario, water use declines by 31%. This decline is due in part to improved technological efficiencies — for example, the use of grey water systems and decentralized wastewater treatment and conservation, but is also a result of higher density housing patterns in which houses have smaller, more resource efficient lawns.

## Health and Well-Being



Source: Exported from PoleStar/Boston Metro 1<sup>st</sup> Order Scenarios

### **Explanation:**

Obesity levels in the Boston region have been increasing at a dramatic pace over the past two decades. The highest rates of overweight residents are associated with Latino and Black communities in the region (about 63% each in 2004). Just between 1999 and 2003, rates of overweight people in the region were reported to have increased from less than 45% to over 52%.

In the Business-As-Usual scenario we expect these trends to continue through 2015 before plateauing at a level where about 60% of residents have a BMI of 25 or higher.

In the Policy Reform scenario, we assume that broad policy changes in other areas (e.g., improved school nutrition education and lunch programs), lead to better information and awareness, along with reduced social and economic inequity, and result in a stabilization of the rate of people with a BMI of 25 or higher at the 2000 level.

In the Deep Change scenario, extensive changes in diet and lifestyle (e.g., shift towards vegetarianism, increased density and walkability/bikability, implementation of a living wage, reduced average work hours and increased time for exercise) are expected to result in dramatic reductions in the rate of overweight Boston residents by 2050, to about 10% of the adult Boston-metro population.