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以下三題請詳讀題目後說明：(1)題目之主要重點及 (2)該題在資源管理之意涵。

(資料來源：Tom Tietenberg and Lynne Lewis(2012), Environmental & Natural Resource Economics, 9th Edition, Pearson Education Inc.)

一、(30%)

Both forests and soils sequester (store) a significant amount of carbon. Research suggests that with appropriate changes in practices, they could store much more. Increased *carbon sequestration* in turn would mean less carbon in the atmosphere. Recognition of this potential has created a strong push in the climate change negotiations to give credit for actions that result in more carbon uptake by soils and forests. Whether this should be allowed, and, if so, how it would be done are currently heavily debated.

Proponents argue that this form of carbon sequestration is typically quite cost-effective. Cost-effectiveness not only implies that the given goal can be achieved at lower cost, but also it may increase the willingness to accept more stringent goals with closer deadlines. Allowing credit for carbon absorption may also add economic value to sustainable practices (such as limiting deforestation or preventing soil erosion), thereby providing additional incentives for those practices. Proponents further point out that many of the prime beneficiaries of this increase in value would be the poorest people in the poorest countries.

Opponents say that our knowledge of the science of carbon sequestration in the terrestrial biosphere is in its infancy, so the amount of credit that should be granted is not at all clear. Obtaining estimates of the amount of carbon sequestered could be both expensive (if done right) and subject to considerable uncertainty. Because carbon absorption could be easily reversed at any time (by cutting down trees or changing agricultural practices), continual monitoring and enforcement would be required, adding even more cost. Even in carefully enforced systems, the sequestration is likely to be temporary (even the carbon in completely preserved forests, for example, may ultimately be released into the atmosphere by decay). And finally, the practices that may be encouraged by crediting sequestration will not necessarily be desirable, as when slow-growing old-growth forests are cut down and replaced with fast-growing plantation forests in order to increase the amount of carbon uptake.

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二、(35%)

The Colorado-Big Thompson (C-BT) Project moves water from the Colorado River to the eastern slope of Colorado. The Northern Colorado Conservancy District distributes the approximately 250,000 acre-feet of water per year to irrigators, towns, cities, and industries in northeastern Colorado. Irrigators with original rights pay approximately $3.50 per share. (A share is, on average, 0.7 acre-foot per year.) Cities pay approximately $7 per share if they hold original rights.

Shares of C-BT water are transferable and are actively traded in the district. Market prices have been at a minimum of $1,800 per share, which translates to approximately $2,600 per acre-foot for perpetual supply or about $208 per year using an 8 percent discount rate. Additionally, prices in the rental market (for users who want to sell or buy water on a one-year basis) range from $7.50 to $25 per acre-foot.

The cities that use the water charge a variety of prices to their customers. Boulder utilizes an increasing block rate structure with an initial block at $1.65 per thousand gallons for the first 5,000 gallons, $3.30 per thousand gallons for the next 16,000 gallons, and $5.50 per thousand gallons over 21,000 gallons per month. Ft. Collins has some unmetered customers, who pay a fixed monthly fee, but no marginal cost for additional use. Its metered customers pay a fixed charge of $12.72 plus water charges determined by an increasing block rate. In the first block the charge is $1.72 per thousand gallons for the first 7,000 gallons. The highest block rate in Ft. Collins is $3.07 for users consuming more than 20,000 gallons per month. Longmont has both metered and unmetered customers and utilizes an *increasing* block rate for its residential customers and a *decreasing* block rate for its small commercial customers.

Economic theory not only makes clear that the marginal net benefits for all uses and users of a given water project should be equal, but also that the common marginal net benefit metric provides a useful indication of the value of the marginal water unit to all users of this resource.

What do we make of the huge variation in these prices? From an efficiency perspective the only difference in observed prices should be a difference in the marginal cost of delivering water to those customers (since marginal net benefit should be the same for all users). The prices from the C-BT project exhibit much more variation than could be explained by marginal conveyance cost, so they clearly are not only inefficient, but they are also sending very mixed signals about the value of this water.

Source: Charles Howe, "Forms and Functions of Water Pricing: An Overview." URBAN WATER DEMAND MANAGEMENT AND PLANNING, Baumann, Boland, and Hanneman, eds., (McGraw-Hill, Inc.: New York, 1998). Rate updates from the cities of Boulder, Longmont, and Ft. Collins, Colorado, and the Northern Colorado Conservancy District (2004).

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三、(35%)

Ten U.S. states—California, Connecticut, Hawaii, Iowa, Maine, Massachusetts, Michigan, New York, Oregon, and Vermont—have passed "bottle bill" legislation. One city, Columbia, Missouri, also passed legislation, but it was repealed in 2002. Delaware's bottle-deposit system was repealed in 2010, effective February 2011. Every year, several states either have proposed new legislation or proposed expansions of existing legislation. More often than not, these proposed bills do not pass. Bottle deposits in the United States range from $0.05 to $0.15 and laws vary on which containers are redeemable for deposits.

While on average, U.S. container recycling rates have been below 40 percent, recycling rates in bottle-deposit states are much higher, averaging around 80 percent. Michigan's $0.10 beverage can deposit produced recycling rates close to 100 percent. Statistics on litter reduction show the largest gains in bottle-deposit states.

Although bottle-deposit states have recycling rates double those of states without deposits, that is not sufficient evidence to suggest that it would be efficient for all states to have them.

Economic studies on the efficiency of bottle deposits are limited. Porter (1983) estimated the costs and benefits of the then newly passed Michigan bottle bill. He found that for most estimates of costs and benefits, the bill passed a benefit–cost test. Ashenmiller (2009) finds that bottle deposits increase the numbers of recycled containers and reduce waste stream costs by diverting these containers away from curbside programs. Using survey data from California, he finds between 36 percent and 51 percent of materials at redemption centers would not have been collected using existing curbside programs alone (without the complementary deposit-refund system). Interestingly, however, some of the success of the California program can be attributed to its design—its curbside programs use volume-based pricing for trash. This analysis also notes that curbside programs work best in densely populated areas and that cash recycling programs can be an important income source for the working poor.

Since the efficiency of deposit–refund systems depends on their cost, they may be efficient for some states, but not others. Key determinants of the relative costs of bottle deposits vary from state to state. Disposal costs depend on landfill availability, and return rates depend on population densities and distances to redemption centers. States with bottle deposits may incur the extra expense of illegal returns from bottles purchased in nearby states that do not require a deposit. Enforcement across state lines is costly and imperfect. States with large bottlers like Coca-Cola are usually opposed to bottle deposits. Does your state have a bottle deposit? Does that seem the right choice?

Sources: http://globalwarming.house.gov/mediacenter/pressreleases?id=0126; www.containerrecycling institute.org; Richard C. Porter, "Michigan's Experience with Mandatory Deposits on Beverage Containers." LAND AND ECONOMICS, 59 (1983); Bevin Ashenmiller, "Cash Recyling, Waste Disposal Costs, and the Incomes of the Working Poor: Evidence from California." LAND ECONOMICS, 85(3), August 2009.