PASSAGE 6

A new study conducted for the World Bank by Murdoch University's Institute for Science and Technology Policy (ISTP) has demonstrated that public transport is more efficient than cars. The study compared the proportion of wealth poured into transport by thirty-seven cities around the world. This included both the public and private costs of building, maintaining and using a transport system.

The study found that the Western Australian city of Perth is a good example of a city with minimal public transport. As a result, 17% of its wealth went into transport costs. Some European and Asian cities, on the other hand, spent as little as 5%. Professor Peter Newman, ISTP Director, pointed out that these more efficient cities were able to put the difference into attracting industry and jobs or creating a better place to live.

According to Professor Newman, the larger Australian city of Melbourne is a rather unusual city in this sort of comparison. He describes it as two cities: 'A European city surrounded by a car-dependent one'. Melbourne's large tram network has made car use in the inner city much lower, but the outer suburbs have the same car-based structure as most other Australian cities. The explosion in demand for accommodation in the inner suburbs of Melbourne suggests a recent change in many people's preferences as to where they live.

Newman says this is a new, broader way of considering public transport issues. In the past, the case for public transport has been made on the basis of environmental and social justice considerations rather than economics. Newman, however, believes the study demonstrates that 'the auto-dependent city model is inefficient and grossly inadequate in economic as well as environmental terms'.

Bicycle use was not included in the study but Newman noted that the two most 'bicycle friendly' cities considered - Amsterdam and Copenhagen - were very efficient, even though their public transport systems were 'reasonable but not special'.

It is common for supporters of road networks to reject the models of cities with good public transport by arguing that such systems would not work in their particular city. One objection is climate. Some people say their city could not make more use of public transport because it is either too hot or too cold. Newman rejects this, pointing out that public transport has been successful in both Toronto and Singapore and, in fact, he has checked the use of cars against climate and found 'zero correlation'.

TRUE
FALSE
NOT GIVEN

6. The ISTP study examined public and private systems in every city of the world.

7. Efficient cities can improve the quality of life for their inhabitants.

8. An inner-city tram network is dangerous for car drivers.

9. In Melbourne, people prefer to live in the outer suburbs.

10. Cities with high levels of bicycle usage can be efficient even when public transport is only averagely good.

PASSAGE 7

One of the first great intellectual feats of a young child is learning how to talk, closely followed by learning how to count. From earliest childhood we are so bound up with our system of numeration that it is a feat of imagination to consider the problems faced by early humans who had not yet developed this facility. Careful consideration of our system of numeration leads to the conviction that, rather than being a facility that comes naturally to a person, it is one of the great and remarkable achievements of the human race.

It is impossible to learn the sequence of events that led to our developing the concept of number. Even the earliest of tribes had a system of numeration that, if not advanced, was sufficient for the tasks that they had to perform. Our ancestors had little use for actual numbers; instead their considerations would have been more of the kind *Is this enough?* rather than *How many?* when they were engaged in food gathering, for example. However, when early humans first began to reflect on the nature of things around them, they discovered that they needed an idea of number simply to keep their thoughts in order. As they began to settle, grow plants and herd animals, the need for a sophisticated number system became paramount. It will never be known how and when this numeration ability developed, but it is certain that numeration was well developed by the time humans had formed even semi-permanent settlements.

Evidence of early stages of arithmetic and numeration can be readily found. The indigenous peoples of Tasmania were only able to count *one, two, many*; those of South Africa counted *one, two, two and one, two twos, two twos and one*, and so on. But in real situations the number and words are often accompanied by gestures to help resolve any confusion. For example, when using the *one, two, many* type of system, the word *many* would mean, *Look at my hands and see how many fingers I am showing you*. This basic approach is limited in the range of numbers that it can express, but this range will generally suffice when dealing with the simpler aspects of human existence.

The lack of ability of some cultures to deal with large numbers is not really surprising. European languages, when traced back to their earlier version, are very poor in number words and expressions. The ancient Gothic word for ten, *tachund*, is used to express the number 100 as *tachund tachund*. By the seventh century, the word *teon* had become interchangeable with the *tachund* or *hund* of the Anglo-Saxon language, and so 100 was denoted as *hund teontig*, or ten times ten. The average person in the seventh century in Europe was not as familiar with numbers as we are today. In fact, to qualify as a witness in a court of law a man had to be able to count to nine!

Perhaps the most fundamental step in developing a sense of number is not the ability to count, but rather to see that a number is really an abstract idea instead of a simple attachment to a group of particular objects. It must have been within the grasp of the earliest humans to conceive that four birds are distinct from two birds; however, it is not an elementary step to associate the number 4, as connected with four birds, to the number 4, as connected with four rocks. Associating a number as one of the qualities of a specific object is a great hindrance to the development of a true number sense. When the number 4 can be registered in the mind as a specific word, independent of the object being referenced, the individual is ready to take the first step toward the development of a notational system for numbers and, from there, to arithmetic.

Traces of the very first stages in the development of numeration can be seen in several living languages today. The numeration system of the Tsimshian language in British Columbia contains seven distinct sets of words for numbers according to the class of the item being counted: for counting flat objects and animals, for round objects and time, for people, for long objects and trees, for canoes, for measures, and for counting when no particular object is being numerated. It seems that the last is a later development while the first six groups show the relics of an older system. This diversity of number names can also be found in some widely used languages such as Japanese.

Intermixed with the development of a number sense is the development of an ability to count. Counting is not directly related to the formation of a number concept because it is possible to count by matching the items being counted against a group of pebbles, grains of corn, or the counter's fingers. These aids would have been indispensable to very early people who would have found the process impossible without some form of mechanical aid. Such aids, while different, are still used even by the most educated in today's society due to their convenience. All counting ultimately involves reference to something other than the things being counted. At first it may have been grains or pebbles but now it is a memorised sequence of words that happen to be the names of the numbers.

TRUE
FALSE
NOT GIVEN

32. For the earliest tribes, the concept of sufficiency was more important than the concept of quantity.

33. Indigenous Tasmanians used only four terms to indicate numbers of objects.

34. Some peoples with simple number systems use body language to prevent misunderstanding of expressions of number.

35. All cultures have been able to express large numbers clearly.

36. The word 'thousand' has Anglo-Saxon origins.

37. In general, people in seventh-century Europe had poor counting ability.

38. In the Tsimshian language, the number for long objects and canoes is expressed with the same word.

39. The Tsimshian language contains both older and newer systems of counting.

40. Early peoples found it easier to count by using their fingers rather than a group of pebbles.

PASSAGE 8

A The history of human civilization is entwined with the history of ways we have learned to manipulate water resources. As towns gradually expanded, water was brought from increasingly remote sources, leading to sophisticated engineering efforts such as dams and aqueducts. At the height of the Roman Empire, nine major systems, with an innovative layout of pipes and well-built sewers, supplied the occupants of Rome with as much water per person as is provided in many parts of the industrial world today.

B During the industrial revolution and population explosion of the 19th and 20th centuries, the demand for water rose dramatically. Unprecedented construction of tens of thousands of monumental engineering projects designed to control floods, protect clean water supplies, and provide water for irrigation and hydropower brought great benefits to hundreds of millions of people. Food production has kept pace with soaring populations mainly because of the expansion of artificial irrigation system that make possible the growth of 40% of the world's food. Nearly one fifth of all the electricity generated worldwide is produced by turbines spun by the power of falling water.

C Yet there is a dark side to this picture: despite our progress, half of the world's population still suffers, with water services inferior to those available to the ancient Greeks and Romans. As the United Nations report on access to water reiterated in November 2001, more than one billion people lack access to clean drinking water: some two and half billion do not have adequate sanitation services. Preventable water-related diseases kill an estimated 10,000 to 20,000 children every day, and the latest evidence suggests that we are falling behind in efforts to solve their problems.

D The consequences of our water policies extend beyond jeopardizing human health. Tens of millions of people have been forced to move from their homes - often with little warning or compensation - to make way for the reservoirs behind dams. More than 20% of all freshwater fish species are now threatened or endangered because dams and water withdrawals have destroyed the free-flowing river ecosystems where they thrive. Certain irrigation practices degrade soil quality and reduce agricultural productivity. Groundwater aquifers* are being pumped down faster than they are naturally replenished in part of India, China, the USA and elsewhere. And disputes over shared water resources have led to violence and continue to raise local, national and even international tensions.

E At the outset of the new millennium, however, the way resource planners think about water is beginning to change. The focus is slowly shifting back to the provision of basic human and environmental needs as top priority - ensuring 'some for all,' instead of 'more for some'. Some water experts are now demanding that existing infrastructure be used in smarter ways rather than building new facilities, which is increasingly considered the option of last, not first, resort. This shift in philosophy has not been universally accepted, and it comes with strong opposition from some established water organizations. Nevertheless, it may be the only way to address successfully the pressing problems of providing everyone with clean water to drink, adequate water to grow food and a life free from preventable water-related illness.

F Fortunately - and unexpectedly - the demand for water is not rising as rapidly as some predicted. As a result, the pressure to build now water infrastructures has diminished over the past two decades. Although population, industrial output and economic productivity have continued to soar in developed nations, the rate at which people withdraw water from aquifers, rivers and lacks has slowed. And in a few parts of the world, demand has actually fallen.

G What explains this remarkable turn of events? Two factors: people have figured out how to use water more efficiently, and communities are rethinking their priorities for water use. Throughout the first three-quarters of the 20th century, the quantity of freshwater consumed per person doubled on average; in the USA, water withdrawals increased tenfold while the population quadrupled. But since 1980, the amount of water consumed per person has actually decreased, thanks to a range of new technologies that help to conserve water in homes and industry. In 1965, for instance, Japan used approximately 13 million gallons* of water to produce $1 million of commercial output; by 1989 this had dropped to 3.5 million gallons (even accounting for inflation) - almost a quadrupling of water productivity. In the USA, water withdrawals have fallen by more than 20% from their peak in 1980.

H On the other hand, dams, aqueducts and other kinds of infrastructure will still have to be built, particularly in developing countries where basic human needs have not been met. But such projects must be built to higher specifications and with more accountability to local people and their environment then in the past. And even in regions where new projects seem warranted, we must find ways to meet demands with fewer resources, respecting ecological criteria and to smaller budget.

YES
NO
NOT GIVEN

21. Water use per person is higher in the industrial world than it was in Ancient Rome.

22. Feeding increasing populations is possible due primarily to improved irrigation systems

23. Modern water systems imitate those of the ancient Greeks and Romans.

24. Industrial growth is increasing the overall demand for water.

25. Modern technologies have led to reduction in the domestic water consumption.

26. In the future, governments should maintain ownership of water infrastructures.