renewable resources including human labour. Value-added tax (VAT) should be levied on value-added activities, such as mining, construction and manufacturing, but not on value-preserving stock management activities such as reuse, repair and remanufacture. Carbon credits should be given to emissions prevention at the same rate as to reduction.

Societal wealth and well-being should be measured in stock instead of flow, in capital instead of sales. Growth then corresponds to a rise in the quality and quantity of all stocks — natural, cultural, human and manufactured. For example, sustainable forestry management augments natural capital, deforestation destroys it; recovering phosphorus or metals from waste streams maintains natural capital, but dumping it increases pollution; retrofitting buildings reduces energy consumption and increases the quality of built stock[10].

Marrying the three types of economy is a formidable challenge. A shift in policy focus from protecting the environment to promoting business models that are based on full ownership and liability, and that are unlimited in time, rather than imposing a two-year warranty for manufacturing quality, could transform a nation's competitiveness. ■

Walter R. Stahel *is founder and director of the Product-Life Institute in Geneva, Switzerland. He is also a member of the Club of Rome and a visiting professor at the Faculty of Engineering and Physical Sciences, University of Surrey, UK.*
e-mail: wrstahel2014@gmail.com

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Stalls known as mtumbas ('second-hand' in Swahili) in Nairobi sell repurposed goods, many from the West.

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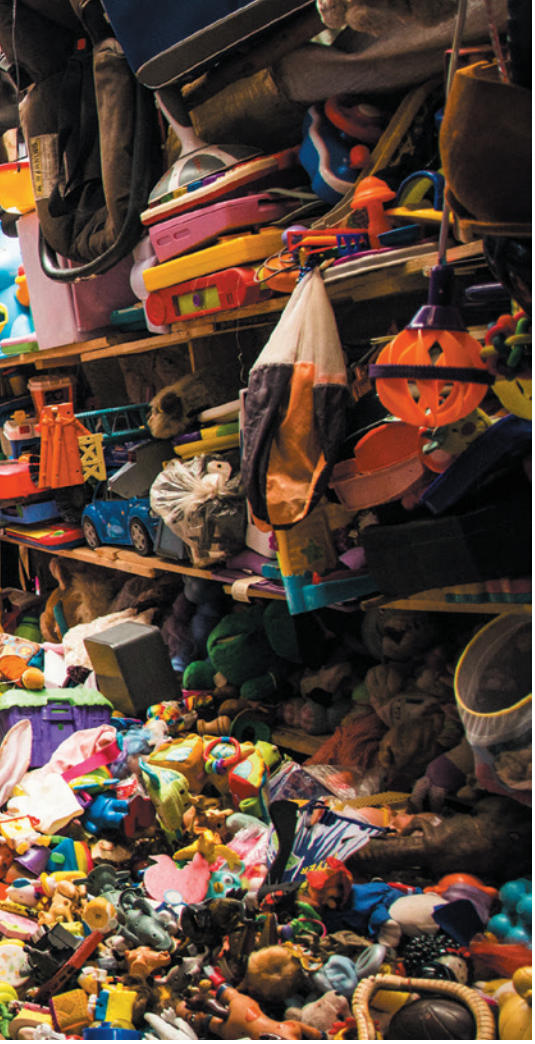
Make recycled goods covetable

To reduce consumption and waste we must overcome our squeamishness about repurposing pre-owned possessions, says **Bruce Hood**.

Humans are unique in the animal kingdom in their capacity for materialism. We make, use and trade objects for their symbolic value as much as their functionality. One of the earliest examples of such artefacts— a piece of carved ochre found in the Blombos Cave in South Africa — dates from at least 70,000 years ago. Possessions are extensions of our selves. Beyond making tools, we adorn ourselves and bury our dead with objects.

Objects have social significance. Through them we signal our identity and status to others. Marketing experts know that belongings convey aspirations that owners wish to display to others. Designer goods have cachet because of their expense or exclusivity. To all but the most ascetic among us, it is important to some degree what others think about our choice of gadgets, car, décor or clothing.

These mores of ownership inform the value that we assign fakes or those who own them. When it comes to second-hand goods, most of us care about who previously handled them and what they were used for — we would rather wear the clothing of a beloved celebrity than a murderer. We reverently hand down great-grandma's costume jewellery to the next generation, but toss last season's bling from



the high street. It is as if something tangible has imbued the very substance of the object.

Underpinning these unconscious, often irrational, preferences is psychological essentialism — a belief that identity is conferred by a metaphysical dimension, an essence that cannot be removed, filtered, eradicated or repurposed by physical means. Countering these biases with logic is difficult.

But countered they must be. Essentialism presents a formidable obstacle to accepting — as we must — that all materials can and should be reused or recycled. To realize a circular economy — in which resources are kept in use for as long as possible — the perceived status and value of reused materials must be changed. How? I think the answer requires us to shift from valuing objects on the basis of exclusivity to a valuation that prioritizes historical reuse.

STATUS SYMBOLS

Some have argued that today's rampant consumerism reflects an obsession with gaining status that originated from our evolved capacity to live in hierarchical social groups in which possessions were equated with success[1]. Status determines reproductive success in many social animals. Just as the male peacock's large and lustrous tail signals his health and strength to prospective mates, so too does evident material wealth in humans.

More than a century ago, US economist and sociologist Thorstein Veblen coined the term conspicuous consumption as the attaining and exhibiting of costly items to impress others[2]. He argued that many people in power, from the Egyptian Pharaohs to the maharajahs of India, flaunted their wealth to signal superiority. Little has changed over millennia.

But our ability to make more possessions has changed. The accumulated store of manufactured goods has risen exponentially with the power of technology to increase production. For example, between 1860 and 1920, US production increased 12–14 times, whereas the population only tripled. The amount of stuff we could make outstripped demand, which needed stimulating to maintain economic growth. Marketing strategies since have reinforced consumerism as a necessary component of self-worth, creating problems from mild binges of 'retail therapy' to pathological over-spending.

This incentive to own does not require much effort — even children are selfish about possessions. More than 80% of preschoolers' conflicts with peers revolve around ownership[3]. Toys are more coveted when they have been touched or named by another child. We soon learn to define ourselves by what we own. Psychologist Sam Gosling, author of *Snoop: What Your Stuff Says About You*[4], has demonstrated links between different personality types and the sorts of objects that adults adorn their personal spaces with as an expression of self-identity. For example, men tend to display trophies and women are more likely to decorate their spaces with objects associated with their relationships.

Because we tend to view ourselves positively, we project greater value onto our own possessions than others would — an impulse called the endowment effect. This bias varies among cultures and is stronger in individualistic compared with interdependent societies. For example, in a 2010 study[5], US adults of European heritage asked for a much higher selling price for their coffee mug compared with Asian American adults. In the same experiment, priming Chinese and Japanese adults to think about themselves shifted the endowment effect in a direction more typical of Westerners.

> ***"The psychological bias to value exclusivity undermines the principles of recycling."***

Surprisingly, the endowment effect may be stronger where there are more rather than fewer possessions. For example, the Hadza hunter-gatherers of Tanzania are all equally poor and do not normally overvalue their own possessions. It is the gap between the haves and have-nots that drives possessiveness, it seems. According to Nicholas Christakis, a sociologist at Yale University in New Haven, Connecticut, the endowment effect arises when inequality in individualistic societies is visible to all[6]. When it comes to economic harmony, ignorance — or greater equality — is bliss.

The 'extended self' hypothesis[7] includes in our 'self' everything that we can claim ownership over. A person who owns a nice home, a new car, good furniture and the latest appliances, is recognized by others as someone who has passed the test of personhood in Western society.

The pleasure one derives from a Rolex watch or an Armani suit is largely psychological and is based on perceived desirability rather than on sensory or functional pay-off. Designer brands are esteemed beyond their quality. By definition, a luxury item (the word coming from the Latin *luxus*, meaning excess) generates value from its exclusivity. Lobsters and oysters command high prices today, but in the eighteenth century, before refrigeration allowed them to be shipped to cities, they were the food of poor fishing communities.

Authenticity also matters. Reproduced items or fake brands are valued less, even though they can be indistinguishable from an original. And we cannot always fool ourselves. One study[8] showed that individuals who wore what they believed to be fake designer sunglasses felt sullied and were more inclined to dishonesty, even when the glasses were in fact expensive originals. Even seven-year-olds rate original possessions supposedly belonging to Queen Elizabeth II as more valuable than identical copies[9].

PSYCHOLOGICAL ESSENTIALISM

The psychological bias to value exclusivity and authenticity undermines the principles of recycling and reuse. Recycled items lack authenticity, which compromises their identity and perceived value.

Most adults reason, for example, that if their gold wedding ring was swapped with a duplicate, it would not be the same ring. If we were told that a small particle of the ring's metal was replaced, we would regard it as the same ring. If we were told that over time the ring was completely renovated, we would still think it the same ring even when there was no original material present — the same as the swapped ring. Thus there is an essential property of the ring beyond its physical make-up that continues its identity.

Such retained identity could operate by contamination. Each new particle of gold added to the ring becomes assimilated into the whole. Simply by touch, objects take on the property of the owner as if by contagion. For example, memorabilia collectors will pay inflated prices for a sweater that they believe was worn by a pop star or famous actor, but much less if it is sterilized. Conversely, they will pay little for one that belonged to a disliked figure (such as a fraudster) unless it has been sterilized[10].

In short, we value old items for their sentimentality, nostalgia or connection with the famous. But not as much as we once did: the Antique Collectors' Club's Annual Furniture Index, based on a mixture of auction and retail prices of 1,400 typical items, has been on the slide since reaching a peak in 2002.

In the same way that conspicuous consumerism was encouraged at the turn of the twentieth century to redress the imbalance between overproduction and demand, policies must now encourage conspicuous non-consumption and reuse as the new signifiers of self-worth.

To address the long-term consequences of unbridled materialism, we need to make having fewer things and using recycled goods more socially desirable. Currently, only a few retailers sell items such as purses and bags that have been ingeniously 'upcycled' from low-value, discarded goods such as cement sacks and tyres. Instead of being niche products, such items should be status symbols. Frugal innovation must become ubiquitous, not just the preserve of poor nations or of times past.

The more recycled material used in an object, the more this quality should be advertised (and rewarded with tax breaks and other market levers). In the same way that food products must declare their constituents and additives, manufactured goods should indicate the extent of their recycled content. Packaging often states the proportion of recycled material used but rarely does the same disclosure appear for the product contained within.

This might start to shift attitudes away from the appeal of the 'brand new' to appreciating the value of the 'brand renewed' — something that will be essential in a sustainable, circular, economy. ■

Bruce Hood *is professor of developmental psychology in society at the University of Bristol, UK, and founder of Speakezee.org.*
e-mail: bruce.hood@bristol.ac.uk

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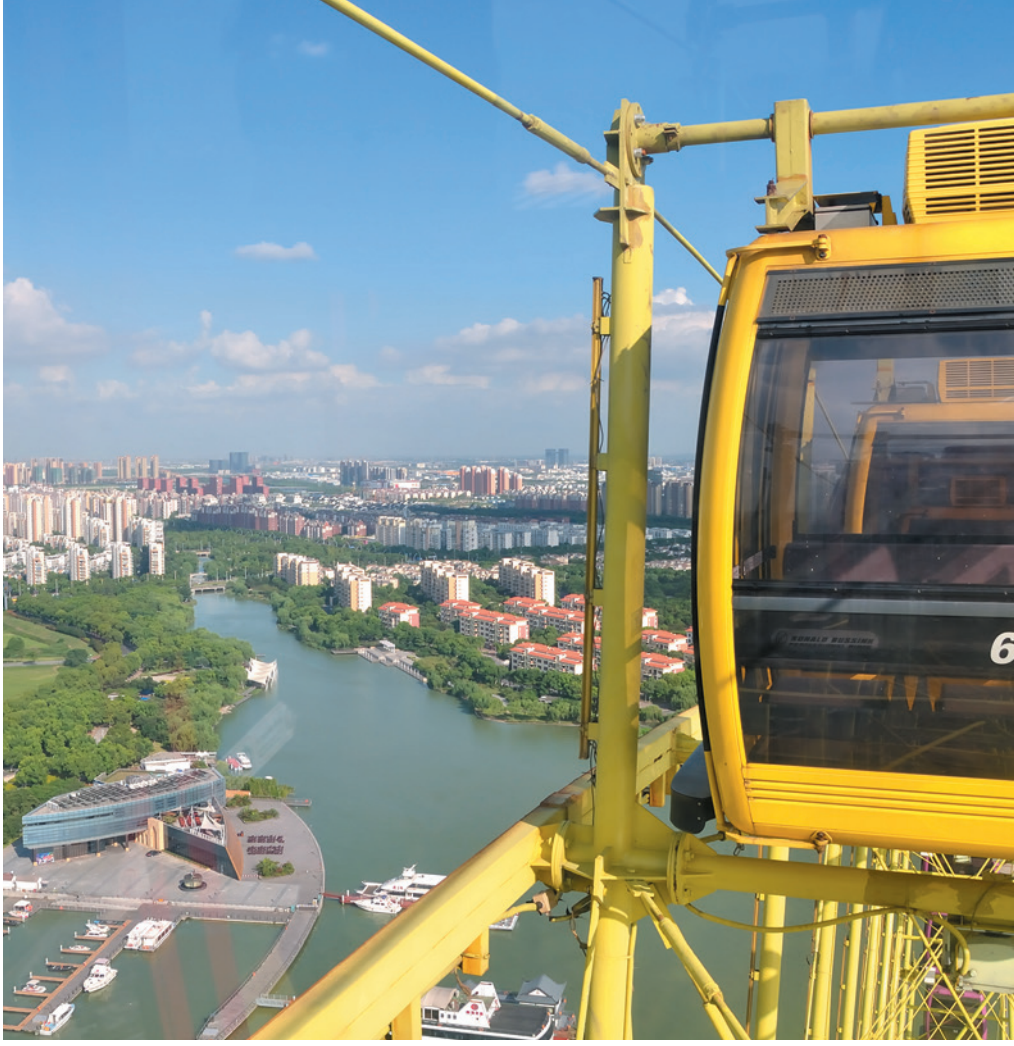

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The Suzhou New District was one of the first industrial parks in China's circular-economy programme.

Lessons from China

The country consumes the most resources in the world and produces the most waste — but it also has the most advanced solutions, say **John A. Mathews** and **Hao Tan**.

China's consumption of the world's resources is reaching crisis levels. To produce 46% of global aluminium, 50% of steel and 60% of the world's cement[1] in 2011, it consumed more raw materials than the 34 countries of the Organisation for Economic Co-operation and Development (OECD) combined: 25.2 billion tonnes.

The nation's resource use is inefficient. China requires 2.5 kilograms of materials to generate US$1 of gross domestic product (GDP) compared with 0.54 kilograms in OECD countries (in 2005 dollars, adjusted for purchasing power parity). And it is wasteful. In 2014, China generated 3.2 billion tonnes of industrial solid waste, only 2 billion tonnes of which was recovered by recycling, composting, incineration or reuse. By comparison, firms and households in the 28 countries of the European Union generated 2.5 billion tonnes of waste in 2012, of which 1 billion was recycled or used for energy. In 2025, China is expected to produce almost one-quarter of the world's municipal solid waste[2].

Unchecked, such levels of consumption and waste will strain the nation and the planet. In December 2015, a landslide at a waste dump in Shenzhen killed 73 people. China has also seen an increasing number of protests by local residents over waste-incineration projects in recent years. The