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Overcoming addiction to consumption: steps to achieve ecosystem health

Ecological Economics

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Abstract

The human body as a complex system of systems is subject to various pressures. Pressures on the human body can arise from an individual's addiction to unhealthy behaviours. Natural resilience allows a body to adapt to these pressures as long as the addiction does not push the system beyond its threshold point to accommodate such changes. Whilst not as well understood, ecosystems and the services they provide are also complex systems. These systems are also able to adapt to pressures and have natural thresholds that should not be breached. In a similar way to how addiction to unhealthy behaviours degrades the health of the human body, our addiction to overconsumption serves to degrade the health of our ecosystems. These ecosystems provide the life supporting functions (goods and services) essential for human survival.

Breaking addiction cycles is difficult despite the benefits to health. This paper aims to provide a systematic approach to address the addiction to the overconsumption of natural capital at an individual level. It draws on proven methods to overcome addiction in the human health field. Drawing on the metaphor of a water catchment as a human body, this paper discusses how addictions can affect the system's ability to function. Using a systems approach, key leverage points in the addiction cycle are discussed. Actions are developed to enable individuals to break their addiction to overconsumption of natural capital and understand how collectively this can contribute to the health of a catchment.

Introduction

The consumption of natural resources is exceeding the level required for humans to provide for their basic needs. It has grown dramatically over the last few decades to a point where the current rate of consumption exceeds the earth's resilience and therefore its ability to provide for the species that depend upon it, including human beings (Assadourian, 2010). This environmental degradation is occurring through both the extraction of natural

resources and the effects of the resulting wastes being returned to the environment (Røpke, 1999). From 1996 to 2010 consumption increased by 28% and whilst the population also increased it is estimated that consumption expenditure tripled per person (Assadourian, 2010). Whilst, consumption is a global issue with consequences appearing in all corners of the globe, statistics suggest it is the rich countries who should shoulder the blame for the rising rate of consumption (Assadourian, 2010), with consumption beyond basic needs the norm in richer societies, a noticeable addiction to overconsumption has been created.

Society's addiction to overconsumption and its resultant effects on the environment are similar to individuals' addictions to unhealthy behaviours and the resulting effects on their bodies. The use of anthropomorphic metaphors to explain scientific, specifically ecological concepts, to the general public has been widely used and proven to be effective (Schaefer, 2006). Despite this, the use of this type of metaphor is not without criticism. Most notably, the metaphor is criticised for being too closely connected to human health (Wicklum & Davies, 1995) and for being overly simplistic (Boulton, 1999). The metaphor relies on a definition of ecosystem health which suggests that optimum state of an ecosystem can be identified and justified (Wicklum & Davies, 1995). Defining such a state is reliant on human values and therefore the concept lacks neutrality (Meyer, 1997). Critics state that overall the concept of ecosystem health is misleading (Calow, 1992).

Anthropomorphic metaphors are however, an effective method to communicate complex systems (Fairweather, 1999; Meyer 1997) by making foreign processes (for example, ecosystems) familiar through comparisons with a known system (for example, the human body) (Calow, 1992). Meyer (1997) describes a healthy ecosystem as one that is sustainable and resilient, which maintains its ecological integrity and function over time whilst meeting societal needs. This link to societal needs is one of the criticisms of the approach, discussed above. This paper utilises a metaphor of a holistic water catchment (from the mountains to the sea) as a human body to illustrate how individuals' addiction to overconsumption is impacting on the ability of the water catchment to function. Further, drawing on lessons from the health sector, the catchment metaphor is used to communicate actions required to break the overconsumption addiction cycle.

Both the human body and ecosystems are complex systems, where each component is interconnected and plays an important role in the functioning of the system as a whole. The systems thinking approach described by Meadows (2008), of considering the relationship between structure and behaviour of coherently organised systems, enables a holistic rather than literal application of the metaphor introduced above. This approach ensures not only the elements of a system are considered but also the role they play in a larger context recognising that a system is more than the sum of its parts (Meadows, 2008). At the systems level the use of a human body metaphor is appropriate to explain the impact of actions on the complete system. The issues identified with the overly literal use of a metaphor can therefore be avoided. The concepts of feedback and resilience, including the ability of systems to change and adapt to respond to events, is critical to applicability of this metaphor (Meadows, 2008).

This paper argues that tools developed in the human health sector can assist individuals overcome their addictions to unhealthy behaviours can also be utilised at a wider level to help society overcome its addiction with the overconsumption of natural resources. To put it simply, addiction is repetitive behaviour resulting in adverse consequences (Angres & Bettinardi-Angres, 2008). Since 1939 a programme known as the 'Twelve Steps' has been used in the health sector to help people overcome all types of addictions and is seen as a recipe to support recovery (Carnes, 2012). It is a spiritual programme that has been used by millions of people around the globe (Miller, 2013 ; Angres & Bettinardi, 2008). The traditional twelve steps can be categorised into three key stages: first, identification of the problem; second, identification of the solution; and third, what action is needed to recover (Angres & Bettinardi-Angres, 2008). Success of the twelve step programme relies on individuals taking action, learning new roles applying new behaviours and sustaining these behaviours (Miller, 2013).

The following sections discuss the three stages (of the 12 steps) to overcome addiction in relation to society's addiction to the overconsumption of natural resources and how to maintain a healthy catchment. First, the human body water catchment metaphor is

introduced. The catchment metaphor is used throughout the paper to illustrate overconsumption and the impacts on the water catchment. Second, the addiction is discussed including the drivers of overconsumption and the impacts this is having on the water catchment, using a causal loop diagram. Third, the relationship between perceived individual gains and consumption is examined, focusing on key leverage points where we can intervene to break the overconsumption addiction cycle and restore the functionality of these complex systems. Fourth, recovery actions are discussed with respect to the key leverage points, focussing on actions at an individual level and how they can collectively contribute to the health of the catchment.

Body Metaphor

The concept of ecosystems providing essential and beneficial services, for human use has been well established. Examples include freshwater ecosystems providing water, climate regulation, air quality and quantity (Constanza, et al., 1997). However, Daily (1997) identifies ecosystem services to humans are not understood, or often even recognised, by the general public and are “greatly unappreciated”. There is clearly a need to communicate the benefits that ecosystems provide. The metaphor of a water catchment to a human body is one way to explain the importance of healthy ecosystems to the general public.

A comparison has been drawn by Schaefer, (2006) between the human body and ecosystems to discuss ecological restoration in relation to human healing. Schaefer (2006) considers using the human body to understand an ecosystem helps promote understanding of ecosystems. Individual systems and organs in the body can be functionally linked to the elements of a ‘mountains to the sea’ freshwater catchment. Freshwater is required by all plants and animals for survival. It is a critical ecosystem service and the demand for freshwater is extensive for all types of human activities (Vance-Borland, et al., 2008). The image of water catchments as systems which run from the mountains to the sea is well established in New Zealand. Maori have a holistic ‘Ki uta ki tai’ (mountains to the sea) perspective. Which views a catchment in its entirety, from its source, the passage of its waters through a network of tributaries onto lower floodplains, to its interface with

saltwater in estuaries along the coast. The concept of a 'Mountains to the Sea' water catchment explicitly addresses linkages between land, freshwater and the coast (Vance-Borland, et al., 2008). This approach is supported by the principle of managing the 'Mauri' or 'life giving essence' of resources (Townsend, et al., 2004). Similarly, the human body is more than the sum of its parts due to the interrelated nature of the systems in the body. All the systems need to work together for the body to function as a healthy body, which, relies on the availability of ecosystem services.

The key components of the freshwater catchment are the waterways themselves, being the streams and rivers, wetlands, estuaries and the water which flows through these into the ocean. The equivalent systems in the human body, at least in a metaphorical sense are the circulatory system, lungs, liver and kidneys. The metaphor proposes blood running through these systems is similar to water in the catchment. Blood pressure is an important measure of health in the human body, comparatively the driving force of a stream or river is its flow which is necessary for invertebrate's respiration and reproduction of some fish. Rivers and streams move water through the catchment, collecting and transferring nutrients from the surrounding land after rainfall events and through groundwater transfer (Jowett, 2009). The blood vessels in the body also transfer nutrients and pick-up waste products. The frequency of floods and low flow events will also influence the biodiversity in a river system. Both these transport systems (waterways and the circulatory system in the body) have a 'normal' channel which can be reduced, by sedimentation in waterways and arteriosclerosis (hardening of the arteries) in the body. If increased pressure occurs, it can result in bursting, for example flooding in water catchments or in the case of the body high blood pressure leading to internal bleeding. The blood and water in the channels carries oxygen and nutrients to all other organisms in the human body and catchment respectively (Imworld, et al., 2005 ; Jowett 2009)

Wetlands are shallow highly vegetated and highly productive systems, where a multitude of biological transformations occur. They can act like sponges soaking up water, during wet periods and releasing it in drier periods (Bullock & Acreman, 2003). Wetlands also function as waste repositories, holding waste products in their sediment and vegetation resulting in

pollutants being filtered from the water (Adhikari, et al., 2011 ; Vance-Borland et al, 2008 ; Thullen et al, 2005).

The human body requires food, water, and air from the environment to function. Examples of this are the respiratory system, particularly the lungs which provide a gas exchange between the (body) system and the atmosphere. In the catchment, this can be related to forests or oceans which perform a similar function. The ability for both of them to function is directly related to the surface area available for transference. The kidney and liver functions of filtering waste products can be correlated to wetlands and estuaries in the water catchment.

Blood in the circulatory system is the primary transport system for oxygen and nutrients to the body's tissue. In return, it collects waste products and transfers them to the kidneys and liver for processing and then excretion from the body (Imworld, et al., 2005). The human body, through its interrelated, regulating systems has an inbuilt ability to adapt to heal itself (Meadows, 2008). The health of a catchment is linked to the health of people living in the catchment, as humans rely on ecosystem services. The health of the ecosystem also depends on the action of the humans in the catchment for example; the availability of forests, wetlands and water flow to maintain a healthy catchment will be largely determined by human activities, including resource use.

Addiction to overconsumption

A key driver of deteriorating health for both the human body and the catchment is human behavior. An individual can choose to consciously behave in a way which maintains the health of these crucial systems. Conversely, an individual can behave in a way which exceeds the system's level of resilience, thereby degrading the overall health and efficiency of the system. This raises two questions. The first is why do people choose to behave in a way which can adversely affect the ability of their body to function as necessary? Secondly, why do people choose to behave in a way which may impact on the effectiveness of

ecosystems to provide ecosystem services crucial to their wellbeing? Human addictions have a role to play in answering both of these questions.

Overconsumption is a prime example of the effect human activities can have on an ecosystem, specifically a catchment. Addictions are characterized by short lived pleasures which are destructive in nature (Pérez & Esposito, 2004). A drug addict is motivated by their apparent need to gain short-term satisfaction from a substance, while concerns of the self-destructive effects on the body fall by the wayside. This can perpetuate to a point at which the substance abuse is affecting the body's ability to function normally or even to function at all. Pérez and Esposito (2004) compare drug addictions to consumption addictions as it follows the same cycle of temporary satisfaction with a long term detrimental effect on the encompassing system. An addiction to overconsumption leads people to act on their material indulgences for short term satisfaction while concern for the health of countless ecosystems is ignored (Pérez & Esposito, 2004).

The way in which a drug addiction can affect human health can be compared to the way in which addictions to overconsumption can affect the health of a catchment. In the human body, the liver removes toxic substances that are consumed with food and water such as alcohol, drugs, and other chemicals (Imworld, et al., 2005). The function of human kidneys is to filter out waste products from the blood and excrete them as urine (Imworld, et al., 2005). If the kidneys or liver are not working correctly, the toxins are not removed resulting in poisoning of the body. This can be compared to the catchment whereby increasing the area covered by wetlands will improve the water quality, as wetlands have a water purification function and act as a sink, through which nutrients, trace metals, sediment, and organic matter are filtered out of surface and ground water (Carter, 1997). As wetlands are destroyed (for example, through drainage) these elements will accumulate in the water and decrease the quality of water. Another comparison is fat accumulation in the arteries and sedimentation in rivers. Unhealthy eating habits or smoking can cause a buildup of fats in human arteries therefore, increasing cholesterol levels and blood pressure, clogging up an individual's circulatory system, and potentially causing heart disease. Similarly, unsustainable land use practices (for example, clearance of hill country vegetation) can

result in accelerated erosion which increases the amount of sediment deposits in rivers and streams (Arriaga & Lowery, 2003) meaning lower water quality and minimized fish habitat (Nerbonne & Vondracek, 2001).

It is suggested that the phenomena of overconsumption is poorly understood even though it is widely acknowledged as a key driver to ecosystem degradation (Wilk, 2002). In particular, the relationship between culture and overconsumption is not well understood. As Assadourian (2010) points out, consumerism has profoundly changed cultures to the point at which it's hard to see the consumption behavior as created by culture in the first place. It has reached the point at which overconsumption can be described as a *global* addiction (Pérez & Esposito, 2004). However, it is necessary to be critical of what this may imply in terms of placing blame for degradation to ecosystem health. Although aspects of addiction to overconsumption can be seen in developing countries, Røpke (1999) asserts that the higher the income of the society the higher the level of material intensive consumerism. Although the addiction is becoming an ever increasing issue globally, the affluent societies are at a further stage in the addiction cycle in which is resulting in the deterioration of global ecosystem health.

It is as important to understand the constructs of addiction to overconsumption, as it is to understand the factors which influence a drug addict to substance abuse. Just like a new drug user equates drug use with happiness and euphoria, consumers equate consumption with success and happiness. In his seminal work *Steady State Economics*, Daly (1992) highlights the fallacy of market capitalism that more is always better. Lintott (1998) argues it is the place of ecological economics to re-examine the dubious benefits of consumption with the endeavor of decreasing adverse effects on ecosystem health while maintaining or increasing human welfare. It is necessary to take a critical view of individual consumption choices which are detrimental to ecosystem health while providing little satisfaction. Using a causal loop diagram (refer to figure 1) where individuals act in the interest of their own satisfaction, is it evident that the amount of consumption is only based on the perceived individual gains. Eventually, there is a need to create a critical mass of individuals who question the gains from consumption. This will eventually equate to a lower reliance on

consumption and hence a reduction in the total activity. As total activity decreases, the actual gains per individual activity increase. In other words, the aim is to decrease consumption but maintain or even increase welfare over time.

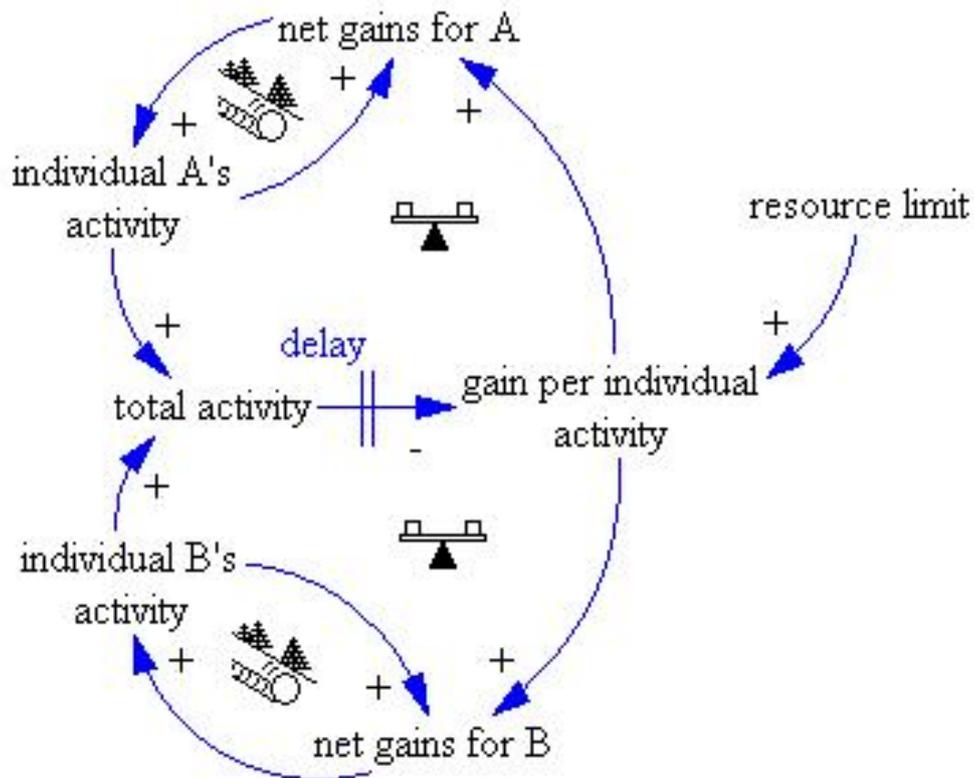


Figure 1: Tragedy of the Commons Causal Loop Diagram (Wikipedia, 2013)

Overcoming Addictions

Having examined society's addiction to the consumption of natural resources it follows to examine how we can break these addictive cycle. Addictive behaviours are difficult to break (Angres & Bettinardi-Angres, 2008) and in order to do so key leverage points within a system, otherwise known as the 'points of power' need to be identified (Meadows, 1999, p. 1). A leverage point within a complex system, such as, a human body or catchment is a point where a small change will have significant effects by generating large changes elsewhere throughout the system (Meadows, 1999). Leverage points are also points of intervention where a system's current direction can change (Hobbs, et al., 2011) It is important to understand the impacts these changes can have on an ecosystem. Meadows (1999)

identified twelve leverage points to intervene in a system, ranging from 'changing parameters' through to transcending paradigms. Of these twelve leverage points, the third and fourth most effective points respectively were: the need for a common goal, and the power to self-organise, as the best way to form resilience (Meadows, 1999). Both these leverage points form the basis to breaking the overconsumption addiction cycle. Through systems thinking, a Causal Loop Diagram illustrates the three key leverage points within the overconsumption addiction cycle (figure 2) which can be manipulated to help conquer the addiction. These leverage points are:

1. Perception - This requires an individual to perceive that there is a problem, recognise the associated risks (McCallum, 1995), and therefore, the need to change. Previous research has identified several key characteristics that influence a person's perception, the most relevant to the human body and catchment metaphor include: the effect on future generations; reversibility of the consequences; personal cost; and do the costs outweigh the benefits (McCallum, 1995).
2. Choice - An individual can choose to either change their behaviour or not. Choice is voluntary and is strongly influenced by rewards, resulting in a bias towards short-term benefits at the expense of the long-term consequences (Naturalism.Org, 2009). Therefore, to change a person's behaviour the reward needs to be altered (Naturalism.Org, 2009) in favour of the new behaviour for example the costs for the old behaviour are greater than the benefits received. Perceiving an issue does not necessarily ensure behaviours will be changed. Accordingly, ways of motivating individuals to make the change should also be considered at this point (Miller, 2013).
3. Commitment - The initial steps to change the behaviour are important, however, maintaining this change is the most difficult step. Therefore, support systems are essential in overcoming addiction (Angres & Bettinardi-Angres, 2008). Positive feedback at the community level is also needed to sustain this behaviour change (McCallum, 1995).

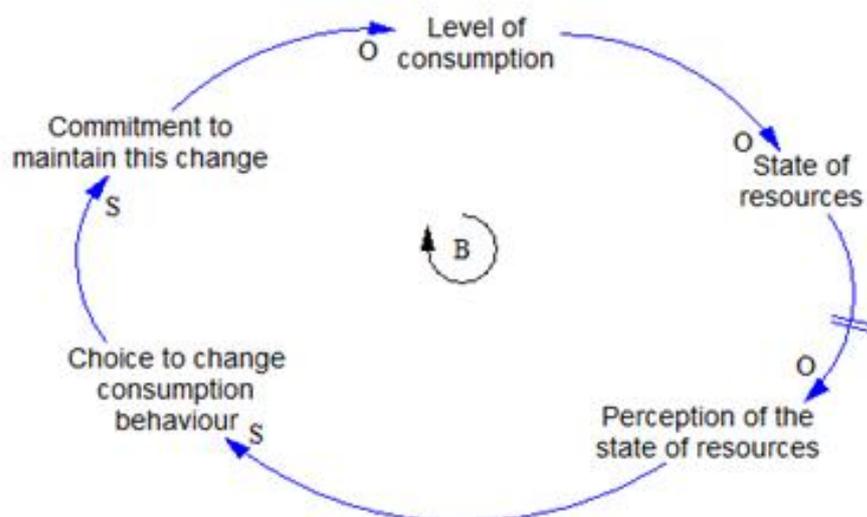


Figure 2: The overconsumption addiction cycle causal loop diagram.

The overconsumption addiction cycle (figure 2) illustrates how an increase in consumption levels leads to a decrease in the state of resources. There is then a significant time delay, where the state of natural resources continues to decline towards its limit while public perception of the impact of consumption on the resources is very slow to change. This is evident in current attitudes to overconsumption and natural resources. Eventually, the limit will be reached, resource shortages will be evident and there will be an increase of individuals' perception of the state of natural resources (first leverage point). As the perception of the state of natural resources goes up it will be more likely to result in a change in individuals' behaviour (second leverage point). If the choice to change is made and the behaviour changes, the level of commitment to maintain the change increases (third leverage point), and as the commitment increases, the level of natural resource consumption decreases. This creates a balancing feedback loop, which occurs when a system has reached its carrying capacity. For the system to recover, it needs to reduce the gap between its present state and the desired goal (a healthy system) (Mirchi, et al., 2012). However, significant time delays in balancing loops can result in limits being exceeded. In this situation, there is the potential to cause irreversible damage to a system resulting in its eventual collapse (Meadows, 1999). As with any change there are always trade-offs. The key is to determine whether the negative consequences (for example, the sacrifice an individual makes in order to reduce the risk associated with their previous behaviour) outweighs the

positives they gain from the behaviour change (McCallum, 1995). Overall, in order to break the overconsumption addiction cycle intervention needs to occur at all three leverage points (perception, choice, and commitment) and the time delay between the state of the natural resources and an individual's perception on their state, needs to be kept to a minimum to avoid overshooting natural thresholds which would result in permanent damage.

Since 1939 a programme known as the 'Twelve Steps' has been used to help people overcome all types of addictions and is seen as a recipe to support recovery (Carnes, 2012). The twelve steps aid in achieving human change and support new behaviours by generating healthier thought processes through the creation of neural pathways (Carnes, 2012). Past literature has shown the twelve step process is successful in breaking alcohol addiction. Therefore, the concept could be used to break the overconsumption addiction cycle. The twelve step process has three constant themes which are the foundation of the recovery process. These three themes are; balance, focus, and a responsibility for self (Carnes, 2012). The 'responsibility for self' places emphasis on an individual having an awareness of their own limits and therefore increases the possibility of recovery (Carnes, 2012). The catchment metaphor above, equating the effect of a drug addiction on the liver and kidneys, and the effect of an addiction to overconsumption on wetlands, has been developed to mirror the sense of 'responsibility for self' in terms of individual's effect on a catchment.

To overcome addiction, behaviour change is required and must be sustained by the individual. In order to be successful three leverage points (perception, choice, and commitment) have been identified, where a small change can be implemented to cause large impacts everywhere (Meadows, 1999), which will aid with healing the system. Interventions at the point of perception, choice and commitment within the overconsumption addiction cycle, will help achieve the goal of decreasing overconsumption of natural resources leading to a healthy catchment in the future.

Communicating Change

Table 1 compares these three points of leverage with the twelve step programme and equates the identified leverage points with actions undertaken during the programme. The table also illustrates the similarities between the three leverage points and the ‘checklist for sustainable change agents’ identified by Ballard (2005) (as cited in Akenji, 2014).

Table 1: Leverage Points, Checklist of Change Agents and 12-Step Equivalent

Overconsumption Leverage Point	Checklist for Sustainable Change Agents (Ballard 2005 as cited in Akenji, 2014)	Substance Abuse 12-Step Equivalent Actions
Perception: The individual must perceive there is a problem. Changes to worldviews. A Vision. Becoming aware of the issues.	Awareness of the issue by stakeholders	Step 1 - Attending a 12-step group to be educated on addiction and discuss experiences with others. This step identifies individual issues and explains the steps needed for recovery. Making the addict aware of their issue (Addictions and Recovery Organisation , 2013)
Choice: Voluntarily choosing to change behaviour to achieve an outcome. Becoming motivated.	Agency or identification of meaningful ways to respond	Step 6 – Being entirely ready to accept change. Lay out and wholly accept the new behaviours that will be the beginning of a ‘lifetime job’ (12 Step Organisation , 2013).
Commitment: Maintaining the change over the long term	Association with likeminded agents both to empower change agents and to mobilise wider	Steps 10, 11 and 12 – Take personal inventory and continue to set right past mistakes. Continually check individual progress and spread the word to other addicts. Be a supported and active

	support	member of the group (12 Step Organisation , 2013).
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Leverage Point 1 - Perception

This involves the crucial step of making the individual aware of the issues and changing their values with respect to consumption, which requires a change in their worldview. At this stage, individuals must move from consumer oriented motives toward a prosocial, pro-environmental value orientation (Brown & Cameron, 2000). This task, however, is not an easy one. It has been identified that individuals often have a limited capacity for behavioural change and many institutional and social factors are at play which form barriers to changing overconsumption behaviours (Mont & Plepys, 2008).

Education is a key factor in changing individual attitudes (Akenji, 2014). Education campaigns can be targeted to challenge the perceived value of consuming and discredit the underlying assumption that consumption is directly linked with happiness (Brown & Cameron, 2000). One approach would be to encourage mindfulness in individual consumers. Mindfulness at its most essential level is an awareness of the influences surrounding an individual and their personal biases. As with all addicts, one of the most critical moments that occur during an addiction is right *after* the urge but right *before* acting on this urge to fulfil it (Miller, 2013). Educating individuals about the effects of overconsumption can enhance mindfulness to address the two central problems of consumerism: (a) the unconscious psychological processes exploited through advertising, and (b) the underlying life dissatisfaction which is temporarily satisfied by consumption (Rosenberg, 2003). When compared to substance addiction, this is directly equivalent to teaching addicts how to avoid situations which ‘trigger’ their addiction. Such situations are often stress related and it is important to teach addicts how to lower the amount of stress they are experiencing and to stop, identify and challenge addictive thinking so it can be replaced with sober, responsible behaviour (Miller, 2013).

An important part of the Twelve Step methodology to enable addicts to connect emotionally with the issues at hand (Miller, 2013). This involves making the individual aware

of how their behaviour is affecting them physically and socially. As hope is integral to overcoming any addiction, the positive benefits of living a healthy, sustainable lifestyle should be emphasised (Kelly, et al., n.d). Drawing from the previous examples, an individual's perception can be changed through a campaign demonstrating the benefits of healthy eating. This approach helps individuals change their thinking from a notion of sacrificing 'tasty' high fat foods and stimulants, to one of saving costs and increasing energy to engage in the activities that are most meaningful to them. Similarly, individual's perceptions can be changed through campaigns which raise awareness of the environmental degradation overconsumption is creating at a local level and which also highlights the benefits healthy waterways and functioning wetlands create for individual recreation, amenity and the catchment's soil productivity.

Techniques to value ecosystem services and map their complex interactions are being developed in the field of ecological economics although these currently contain large uncertainties (Constanza, et al., 1997). One challenge is providing a clear link between purchasing choices and environmental improvements at the individual level. There is also a lack of consensus on the actual definition and level at which consumption becomes sustainable (Mont & Plepys, 2008). Websites such as the one run by Sustainable Living (Sustainable Living New Zealand , 2014) go some way to addressing this issue by offering an online tool to measure an individual's carbon footprint. A pressing issue is the potential to exceed the ecosystem threshold point as a result of the identified time lag between when natural resources are consumed, and when environmental degradation is actually perceived by the consumer. Organisations such as NZ Landcare Trust offer a strategy to combat this by providing individuals with extensive information on certain ecosystems and indicators of degrading catchment health. They advocate for becoming involved in the catchment and regular monitoring which can be done collectively by individuals in 'catchment groups' (NZ Landcare Trust , 2010).

Leverage Point 2 - Choice

Making a choice to change behaviour requires individuals to have the capability to identify meaningful ways to respond. This includes the important aspect of ensuring the individual is

actually *motivated* to change. In the case of overconsumption, individuals must become 'environmental citizens'. Schaefer (2006) defines an environmental citizen as "someone who becomes informed on a topic and then, as a result of that information, takes action" (p. 2). It has been common practice in the past to inform the public and trust this alone will encourage people to take action. While this sometimes works, often as with any addiction it does not as the person simply becomes informed but not motivated enough to act. Schaefer suggests at the individual level 'environmental stewardship', which is a subset of environmental citizenship, could involve creating a backyard habitat for indigenous species through the planned planting of native vegetation and the active removal of pests at an individual's place of residence. Websites such as Sustainable Living (2014) and the government funded Citizen Advice Bureau (2010) provide information on behaviours that can be undertaken at an individual level to reduce consumption. Community groups operating at the catchment level also provide valuable expertise and experience to individuals. One such initiative is the Whau River Catchment Trust which runs volunteer initiatives to remediate the Whau River (The Whau River Catchment Trust, 2014). Such community groups also help to motivate individuals through being visible, active and achieving results within the catchment.

Leverage Point 3 - Commitment

The third leverage step 'commitment' is committing to maintain the new behaviours over the long term. In the twelve step method, a peer group with the shared goal of individual and group well-being and sobriety is an essential and ever present influence. The group models more adaptive behaviours and creates an overall expectation of abstinence and empathy. These group dynamics play a large role in enhancing the motivation and compliance of recovering addicts (Angres & Bettinardi-Angres, 2008). Similarly, consumers operate within a social system with a myriad of direct and indirect influences on individual behaviour. It is helpful to conceptualise this in the following model (Figure 3).

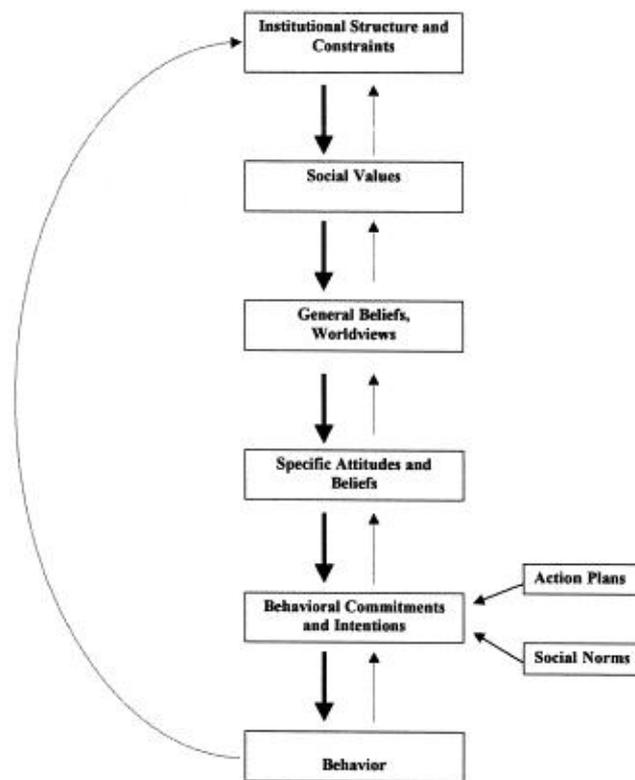


Figure 3: The roles of institutional structure, social values, worldviews, attitudes, and intentions in determining consumption behaviour (Brown & Cameron, 2000, p. 32).

The model illustrates a hierarchy of influences on individual behaviour. According to this model, the higher-level structures are more stable and are more resistant to change relative to lower level ones. Higher-level structures also have more influence on lower-level structures than vice-versa and this is indicated by the boldness of the arrows. The conclusion drawn from this model is that interventions aimed at reducing individual overconsumption behaviours will be most effective when they can bring about higher level changes (Brown & Cameron, 2000). This model makes explicit what the twelve steps programme and Ballard (2005 as cited in Akenji, 2014) have already identified in Table 1 - association with likeminded people empowers individual to change and to mobilise wider support is an important agent for sustainable change.

Support networks must be established in order to encourage individuals to reinforce and maintain new consumption habits over the long-term. Ideally, this would be in the form of high level institutional change which, in turn would have significant influence on those

further down the hierarchy. In reality, this would require a change to the dominant economic model - the capitalist free-market economy, as it drives consumption. It is clear that an institutional move away from materialism (overconsumption) will not occur unless this dominant economic paradigm changes (Kasser, et al., 2003). Until this occurs, actions that can be taken at the individual and catchment levels include; networking and 'spreading the word' both intra and inter-generationally, being an active and supportive member of the catchment, encouraging group knowledge sharing, and monitoring individual consumption levels and adjusting habits accordingly (adaptive management).

In the case of substance abusers, individuals should be around people, places and things that do not support using drugs. In the twelve step programme, this need is met by support groups, family members and trained medical staff. In the case of maintaining sustainable consumption at a catchment level, like minded friends, family and businesses which run sustainable operations and product lines must be encouraged and supported.

Conclusion

This paper has established an individual's addiction to the overconsumption of natural resources is not dissimilar to an individual's addictions to unhealthy behaviours that have adverse effects on the human body. Using a human body catchment metaphor the paper has examined the drivers for overconsumption and the impacts this is having on our ecosystems. It has highlighted catchments are able to adapt and form a level of resilience, similar to that of the human body. However, both systems have a threshold and if reached the result will be disastrous and possibly irreversible. Examples were used to show how behaviour change can break an addiction and that changes need to occur at key leverage points within an addiction cycle in order for an addiction to be conquered. In the case of the overconsumption of natural resources at a catchment level systems thinking was used to identify key leverage points namely, perception, choice, and commitment. However, in order to overcome any addiction it has been established that interventions are required at all key leverage points in the cycle, and to be effective the management of any addiction has to be ongoing process. To address the overconsumption of natural resources, actions at the individual and catchment level have been identified. These actions can be employed to

create the desired shifts at the three key leverage points in the overconsumption addiction cycle. Key actions include: (a) increasing individual and catchment knowledge through education, (b) developing consumer self-awareness and actively challenging influences which drive the tendency to over consume resources, (c) individuals engaging in a process of adaptive management to constantly monitor their actions, and, (d) establishing and nurturing support networks and businesses which promote sustainable consumption. Utilising these actions at an individual and catchment level will collectively assist in creating healthy ecosystems and enable them to continue to provide a range of ecosystem services. Lastly, the paper has reinforced the usefulness of the human body catchment metaphor to communicate unfamiliar knowledge to individuals.

Reference List

- 12 Step Organisation , 2013. *The 12 Steps*. [Online]
Available at: <http://www.12step.org/the-12-steps/step-6.html>
[Accessed 30 January 2014].
- Addictions and Recovery Organisation , 2013. *12 Step Groups*. [Online]
Available at: <http://www.addictionsandrecovery.org/12-step-groups.htm>
[Accessed 23 January 2014].
- Adhikari, A. R., Acharya, K., Shanahan, S. A. & Zhou, X., 2011. Removal of Nutrients and Metals by Constructed and Naturally Created Wetlands in Las Vegas Valley, Nevada. *Environmental Monitoring and Assessment* , 180(1-4), pp. 97-113.
- Akenji, L., 2014. Consumer scapegoatism and limits to green consumerism. *Journal of Cleaner Production* , January.p. 17.
- Angres, D. & Bettinardi-Angres, K., 2008. The disease of addiction: origins, treatment and recovery. *Dis Mon*, October.
- Angres, D. & Bettinardi-Angres, K., 2008. The Disease of Addiction: Origins, Treatment and Recovery. *Disease a Month*, 54(10), pp. 696-721.
- Arriaga, F. & Lowery, B., 2003. *Erosion and Productivity*. *Encyclopedia of Water Science*. [Online]
Available at: www.ars.usda.gov/SP2UserFiles/Place/64200500/csr/ResearchPubs/
[Accessed 01 02 2014].
- Assadourian, E., 2010. The Rise and Fall of Consumer Cultures. *State of the World* , pp. 3-20.
- Boulton, A. J., 1999. An Overview of River Health Assessment. *Freshwater Biology*, Volume 41, pp. 469-479.
- Brown, P. & Cameron, L., 2000. What can be done to reduce overconsumption?. *Ecological Economics* , January, Volume 32, pp. 27-41.
- Bullock, A. & Acreman, M., 2003. The Role of Wetlands in the Hydrological Cycle. *Hydrology and Earth Systems Science* , 7(3), pp. 358-369.
- Calow, P., 1992. Can Ecosystems be Healthy? Critical Consideration of Concepts. *Journal of Aquatic Ecosystem Health* , Volume 1, pp. 1-5.
- Carnes, P. J., 2012 . *A Gentle Path Through the 12 Steps*. [Online]
Available at: <http://www.scribd.com/doc/193259077/A-Gentle-Path-Through-the-12-Steps-and-12-Principles-Bundle-a-Collection-of-Two-Patrick-Carnes-Best-Carnes-Patrick-J>
[Accessed 01 02 2014].

Overcoming Addiction to Overconsumption: Steps to Achieve Ecosystem Health
Sarndra Dron, Matt Gouge, Rebecca Heenan, Emily Thomson & Peri Zee

Carter, V., 1997. *Technical Aspects of Wetlands: Wetland Hydrology, Water Quality, and Associated Functions*. *National Water Summary on Wetland Resources*. United States Geological Survey Water Supply Paper 2425. [Online]

Available at: water.usgs.gov/nwsum/WSP2425/hydrology.html

[Accessed 01 02 2014].

Citizens Advice Bureau, 2010. *Environment and Sustainability*. [Online]

Available at: <http://www.cab.org.nz/vat/hle/es/Pages/home.aspx>

[Accessed 5 February 2014].

Constanza, R. et al., 1997. The value of the worlds ecosystem services and natural capital. *Nature*, 15 May.

Daily, G. C., 1997. *Nature's Services: Societal Dependence on Natural Ecosystems*. 1 ed. Washington: Island Press.

Daly, H., 1992. *Steady State Economics*. 2cnd ed. Washington DC: Island Press .

Fairweather, P., 1999. State of the Environment Indicators of 'River Health': exploring the Metaphor. *Freshwater Biology* , Volume 41, pp. 211-220.

Hobbs, R., Hallet, L., Ehrlich, P. R. & Mooney, H. A., 2011. Intervention Ecology: Applying Ecological Science in the Twenty-first Century. *BioScience* , 61(6), pp. 442-450.

Imworld, D., Olds, M. & Parker, J., 2005. *Anatomica: The Complete Home Medical Reference*. New South Wales : Global Book Publishing .

Jowett, I. G., 2009 . Application of the 'Natural Flow Paradigm' in a New Zealand Context. *River Research Applied* , 25(9), pp. 1126-1135.

Kasser, T., Ryan, R., Couchman, C. & Sheldon, K., 2003. Materialistic Values: Their Causes and Consequences. In: *Psychology and Consumer Culture: the Struggle for a Good Life in a Materialistic World*. Washington: American Psychological Association.

Kelly, J., Kochanowicz, A. & Herrick, J., n.d. *4 Ways to Overcome Addiction*. [Online]

Available at: <http://www.wikihow.com/Overcome-an-Addiction>

[Accessed 7 February 2014].

Lintott, J., 1998. Beyond the Economics of More: The Place of Consumption in Ecological Economics. *Ecological Economics* , Volume 25, pp. 239-248.

McCallum, D. B., 1995. Risk Communication: A Tool for Behavior Change. *National Institute on Drug Abuse Research, Monograph Series*, pp. 65-89.

Meadows, D. H., 1999. Leverage Points: Places to Intervene in a System. *The Sustainability Institute* , pp. 1-19.

Meadows, D. H., 2008. *Thinking in Systems*. Vermont : Chelsea Green Publishing .

Overcoming Addiction to Overconsumption: Steps to Achieve Ecosystem Health
Sarndra Dron, Matt Gouge, Rebecca Heenan, Emily Thomson & Peri Zee

- Meyer, J. L., 1997. Stream Health: Incorporating the Human Dimension to Advance Stream Ecology. *Journal of North American Benthological Society*, 16(2), pp. 439-447.
- Miller, C., 2013. Integrating two models for the treatment of addictions: souldrama and 12-step recovery in action. *Journal of Groups in Addiction and Recovery*, 20 April, 8(2), pp. 81-111.
- Mirchi, A., Madani, K., Watkins Jr, D. & Ahmad, S., 2012. Synthesis of System Dynamics Tools for Holistic Conceptualization of Water Resources Problems. *Water Resource Management*, Volume 26, pp. 2421-2441.
- Mont, O. & Plepys, A., 2008. Sustainable Consumption Progress: Should we be Proud or Alarmed. *Journal of Clearer Production*, July.
- Naturalism.Org, 2009. *Choosing Irrationality - review of Addiction: A Disorder of Choice by Gene M. Heyman*. [Online]
Available at: <http://www.naturalism.org/Heyman.htm>
[Accessed 01 02 2014].
- Nerbonne, B. A. & Vondracek, B., 2001. Effects of local land use on physical habitat, benthic macroinvertebrates, and fish in the whitewater river, Minnesota, USA.. *Environmental Management*, Volume 28, pp. 87-99.
- NZ Landcare Trust, 2010. *Caring for our Catchments*. [Online]
Available at: <http://www.landcare.org.nz/files/file/307/6-caring-for-our-catchments.pdf>
[Accessed 3 February 2014].
- Pérez, F. & Esposito, L., 2004. The Global Addiction and Human Rights: Insatiable Consumerism, Neoliberalism and Harm Reduction. *Perceptions on Global Development and Technology*, Volume 9, pp. 84-100.
- Røpke, I., 1999. The Dynamics of Willingness to Consume. *Ecological Economics*, Volume 28, pp. 399-402.
- Rosenberg, E., 2003. Mindfulness and Consumerism. In: *Psychology and Consumer Culture: the struggle for a good life in a materialistic world*. Washington: American Psychological Association.
- Schaefer, V., 2006. Science, Stewardship, and Spirituality: the Human Body as a Model for Ecological Restoration. *Restoration Ecology*, March.
- Sustainable Living New Zealand, 2014. *Sustainable living information*. [Online]
Available at: <http://www.sustainableliving.org.nz/Information.aspx>
[Accessed 3 February 2014].

Overcoming Addiction to Overconsumption: Steps to Achieve Ecosystem Health
Sarndra Dron, Matt Gouge, Rebecca Heenan, Emily Thomson & Peri Zee

The Whau River Catchment Trust, 2014. *The Whau River Catchment Trust*. [Online]

Available at: www.whauriver.org.nz

[Accessed 5 February 2014].

Thullen, J. S., Santoris, J. J. & Nelson, S. M., 2005. Managing Vegetation in Surface-flow Wastewater Treatment Wetlands for Optimal Treatment Performance. *Ecological Economics*, Volume 25, pp. 583-593.

Townsend, C. R., Tipa, G., Tierney, L. D. & Niyogi, D. K., 2004. Development of a Tool to Facilitate Participation in Maori in the Management of Stream and River Health. *Ecohealth*, Volume 1, pp. 184-195.

Vance-Borland, K., Roux, D., Jeanne, J. & Pressey, B., 2008. From the Mountains to the Sea: Where Is Freshwater Conservation in the SCB Agenda?. *Conservation Biology*, 22(3), pp. 505-507.

Wicklum, D. & Davies, R. W., 1995. Ecosystem Health and Integrity. *Canadian Journal of Botany*, Volume 73, pp. 997-1000.

Wikipedia, 2013. *System Archetypes*. [Online]

Available at: http://en.wikipedia.org/wiki/System_archetype

[Accessed 17 02 2014].

Wilk, R., 2002. Consumption, Human Needs, and Global Environmental Change. *Global Environmental Change*, Volume 12, pp. 5-13.