

# **PRECIPITATION, PEOPLE, PIPELINES AND POWER: TOWARDS A ‘VIRTUAL WATER’ BASED POLITICAL ECOLOGY DISCOURSE**

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By

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### **INTRODUCTION:**

There is a growing discourse that is currently taking shape within the broader social science community at the level of metatheory. This discourse, termed “political ecology”, challenges the very notions on which various aspects of the scientific endeavours that keep so many social scientists busy, can in fact be called a science at all. In fact, political ecologists question the relationship between man and the environment in a manner that challenges the basis of individual social sciences as separate disciplines, while creating an overarching framework within which interdisciplinary research can take place in a meaningful way. This paper attempts to place what the author considers to be a key developmental problem that exists within Southern Africa – the spatial and temporal maldistribution of water and its relationship with the spatial distribution of the human population – within this broader political ecology discourse. This will be achieved, as a point of departure, by summarising what some of the current political ecology theorists are writing about the discourse at present. This will be followed by an attempt to identify and isolate what the author considers to be key variables within the context of the Southern African water sector. A theoretical model will then be built, based on different relationships between these variables, in the hope that this would contribute to a debate on what the political ecology discourse for water in Southern Africa could hope to achieve in terms of multidisciplinary in future, if co-operative research were to be initiated. The paper will be concluded with a suggested research agenda for the future.

### **PHILOSOPHICAL BACKGROUND:**

Political ecology, as espoused by Atkinson (1991), is an ideology as much as it is a methodology. It represents a paradigm with strong political undertones that is based on the philosophical roots that emerged from the Enlightenment and subsequent Marxist ideology. As such it has a strongly normative dimension. The philosophical basis of the argument is vested in the notion of ‘alienation’. For example, Medieval monks overcame their sense of ‘alienation’ by embracing the socially accepted ideology of religion. Whilst this may well have made them happy at the time, the philosophical point is that their religion was a surrogate solution to the fundamental problem, which is consciousness in nature (Atkinson, 1991:88). In essence, man has become alienated from ‘nature’

according to the doctrine of ‘political ecology’. Essentially what Atkinson is saying about political ecology can best be understood by means of the following logic.

- ✳ Political ecology is concerned in the first instance with the need to make fundamental changes in the social and political machinery that structures our daily lives. To this end, the ultimate reconfiguration of these social dynamics “will have to square with the sustainable self-reproduction of nature”. This implies that there are definite choices about how we live our lives in relation to the use of nature. The ultimate social choice is therefore encapsulated in the question: “Will the choices currently being made by our society satisfy our material and spiritual needs and avoid ecological destruction?”(Atkinson, 1991:171). In other words, political decision-making lies at the heart of the debate and can in fact be construed as being one of the problems.
- ✳ One necessary pre-condition for the ultimate achievement of a consciously self-regulating society is the requirement to simplify and render more transparent the operations of society and our relationship with nature (Atkinson, 1991: 180-1). In other words, there is a desire among the population of a given political entity, to increasingly be allowed to question the decisions that are made by political decision-makers. The role of NGOs with an environmental agenda becomes particularly relevant in this regard. Environmental Impact Assessments (EIA’s) can therefore be seen as becoming increasingly important, and as a result, likely to become more politicized in future.
- ✳ Another necessary pre-condition for attaining a self-regulating society, is the need to diffuse the social tensions that result from the currently existing inegalitarian social relations and social division of labour (Atkinson, 1991: 181), which result from the individualistic way of life that currently dominates the planet earth. In other words, the mechanisms by which allocations are made<sup>1</sup> are likely to become the locus of conflict in their own right.
- ✳ The hallmark of capitalist consumerism - the incessant urge to accumulate - is the fundamental cause of the impending ecological catastrophe. To this end, the attitudes that dominated within the Northern European countries during pre-capitalist times rapidly turned into endless strategies of aggressive accumulation at the expense of other cultures. Extended logically, using Weber’s way of thinking, accumulation at the expense of other cultures would lead ultimately to the destruction of Northern European culture and then finally, to the destruction of nature itself. To destroy nature, is in essence to destroy oneself. For this reason, it is necessary to destroy the impetus of our cultural logic whilst simultaneously building new structures that will enable our descendents to live “in a sustainable relationship with the rest of Creation” (Atkinson, 1991:187). To this end, political ecology sees that capitalism cannot be

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<sup>1</sup> In this regard the pioneering research that is being done by Leif Ohlsson (1999) is of great value. This suggests the existence of both a first and second order conflicts. A first order conflict is seen to be as the direct result of competition for access to water. As water becomes scarcer, allocations will need to be made which means that a regulative framework will in turn result in a second order of conflicts.

confronted in any way except for its universal overthrowal. As such, there is a general consensus that a viable future will rest upon the philosophical premises of the realization of the promise encapsulated in the ‘ecological paradigm’ (Atkinson, 1991:194). In other words, because the consumerism of the North is seen as being at the heart of the problem<sup>2</sup>, this opens the way for political ecology thinking to become part of the emerging North-South agenda<sup>3</sup>.

- ✳ Extending this ecological paradigm backwards in time, Atkinson (1991:195) notes that modern day “organicist philosophy” can be traced back to the conceptions of Hegel and Marx with respect to the terms of reference of an adequate secular philosophy. Stated simply, Hegel’s ‘philosophical system’ is interpreted by Atkinson in terms of presenting the active human consciousness on the one hand, with nature on the other, as dialectical moments unified through the cultural and political process. Marx translated Hegel’s second dialectical moment – nature – into the way in which society exploits nature through ‘modes of production’. Therefore, nature in-itself was lost by this translation. The excuse for ignoring nature as such by Marx is therefore highly relevant in the quest for the need to re-establish the balance of the Hegelian dialectic. Seen from this perspective, Marxist philosophy is not a ‘dialectic materialism’ at all, but rather a ‘dialectic humanism’ or ‘dialectic socialism’ (Atkinson, 1991: 196). As such, the philosophy of a viable ecological future is a true ‘dialectic materialism’ in that its main concern is confronting the fundamental material natural process – ecology – with human consciousness, “resolved in an appropriate cultural, social and political framework that is capable of operationalising human needs in nature on an everyday basis and into the long-term” (Atkinson, 1991:196). In other words, political ecology is more than just environmental politics. It represents instead, a whole new philosophy that questions the relationship between man and the environment in a fundamental manner, raising a whole new specter of social and political ramifications<sup>4</sup>.
- ✳ Political ecology therefore provides the answer to the fundamental problem of ‘alienation’ by means of a philosophy of ecological consciousness otherwise known as ‘sustainability’

As can be seen, political ecology as espoused by Atkinson (1997) can be regarded as being somewhat reactionary. This may well mean that the current water sector decision-makers in Southern Africa are likely to view the whole discourse as being radical, politicized and possibly even too far-fetched to be actually taken seriously. This clearly

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<sup>2</sup> Barry Buzan (1994) raises the notion of a relationship between the centre-periphery structure of the post-cold war political economy that gives the centre both the power and the international legitimacy to reimpose a degree of unequal political relations on the periphery. This is placed within the context of water in Turton, 1999(a) where it is shown that NGOs challenge the sovereignty of the developing state by monopolizing the ‘adaptive capacity’ that the developing state lacks.

<sup>3</sup> The works of authors such as Berel Rodal (1996) are illuminating in this regard. Rodal states for example that the post-cold war era has ushered in a new, “truly international agenda” that is dominated by global environmental issues. For a discussion of this aspect within a water context, refer to Turton, 1999(a).

<sup>4</sup> Conrad Kottak (1998) alludes to some of these as constituting a challenge to the state. Refer to Turton, 1999(a) for a discussion of this in the context of water.

has implications for scientific writing that is generated using the political ecology approach, specifically regarding the possible use of that research by decision-makers. Significantly, while political ecologists are highly critical of the merits of the concept of “sustainable development”, they have yet to develop an alternative to this mainstream concept of “sustainable development” however (Bryant & Bailey, 1997: 4).

It therefore becomes illuminating to examine political ecology from another perspective, in order to gain a deeper insight into the possible value of the discourse. Essentially there are three clearly discernable phases of writing, according to Eckersley (1997) that can be attributed to political ecologists. Each of these phases can be linked to distinct ecological themes or pre-occupations (Eckersley, 1997:7). These are:

- ✳ Participation
- ✳ Survival
- ✳ Emancipation

The participation phase can be regarded as being the thesis to the overall political ecology debate, with the survivalist phase being regarded as the antithesis and the emancipatory phase being the higher synthesis.

The first phase of political ecology thinking was triggered off by the widespread public concern over environmental degradation in the developed countries of the West during the 1960's. After years of persistent agitation, this movement managed to get acknowledgement that an environmental crisis did in fact exist. An important milestone in this endeavor was the Earth Day celebration in 1970. This was the first form of public recognition that ecology mattered. Emerging from this debate was the specific notion that there may in fact be ecological limits to ‘economic growth’ that could not be overcome by human technological ingenuity (Eckersley, 1997:8). In other words, there seemed to be two distinct concepts, each mutually exclusive to the other. On the one hand ‘economic growth’ was seen to have taken place only at the expense of ecological destruction. In this sense, ‘ecological sustainability’ was seen for the first time to be distinctly separate from ‘economic growth’ and in fact, as the thinking went at that time, may not be attainable if ‘economic growth’ was the desired condition. The predominant form of political thinking during this phase was centered around what was seen as the crisis of participation, whereby excluded groups sought to ensure a more equitable distribution of environmental “goods” (Eckersley, 1997:9).

Whilst this debate focussed on notions of limits to what the environment could provide, it also tended to reinforce, rather than challenge, the prevailing view of the environment as being just another resource there for human consumption. Running concurrently with this development, was a period of revision of socialist theory in general, spearheaded by the rise of the New Left. The ideas that emanated were thus readily absorbed into the counter-culture and “back to nature” movements of the 1960s (Eckersley, 1997:10). This incorporated notions of grassroots democracy and social justice, which are two pillars on which modern Green parties rest today (Eckersley, 1997:11).

The second phase of political ecology thinking grew from the first, participatory phase, with the threshold between them being the publication of two prominent documents. The first was the Club of Rome's "*The Limits to Growth*" and The Ecologist magazine's "*Blueprint for Survival*" (Eckersley, 1997: 11-12). This marked the shift in intellectual thinking away from seeing the problem merely as one of participation, to one of actual survival. This seed of thought found fertile ground in the minds of the human population who at that time were starting to see the first NASA imagery of earth, floating as it were as an "oasis in the desert of infinite space" (Eckersley, 1997:12) This spawned the metaphor of our planet as the spaceship earth. In other words, gone was the notion of an ever-expanding boundary to the economy, almost akin to the Wild West, and for the first time the realization dawned that a new normative framework was in order, based instead on assumptions of relative efficiencies and recycling<sup>5</sup>. Significantly, this also served to add a global dimension to the problem, manifesting in notions of environmental collapse being the common fate of humanity. Emerging from this was the first European Green party, the British People's Party, which subsequently changed its name to the Ecology Party in 1975 and later to the British Green Party in 1985 (Eckersley, 1997:12). The development of the belief that economic growth was limited by ecological constraints resulted in a number of arguments, which sought to show that the solution to the doomsday scenario lay in the development of technology and pricing solutions.

Yet despite the number of methodological problems that were inherent to the "*Limits to Growth*", these seem not to have detracted to any appreciable extent from the core message. This message was even present in the Club of Rome's 1974 report which was issued in response to the reaction that resulted from the original 1972 "*The Limits to Growth*" (Eckersley, 1997:13). An extract of this reads as follows:

"For the first time in man's life on earth, he is being asked to refrain from doing what he can do; he is being asked to refrain his economic and technical advancement<sup>6</sup>, or at least to direct it differently from before; he is being asked by all future generations of the earth to share his good fortune with the unfortunate – not in a spirit of charity, but in a spirit of survival."

The landmark essay, "*The Tragedy of the Commons*" by Garrett Hardin (1968) also emerged from this phase. Hardin's now famous parable of the medieval herdsmen overstocking the commons demonstrates the dynamic that prevails when people are motivated solely by the objective of maximizing economic gains in the short-term. Hardin's answer to this tragedy was "mutual coercion, mutually agreed upon by the majority of the people effected". This was indicative of the fact that the survivalists' key concern was the means of finding a solution to the impending ecological disaster, by discovering a minimally acceptable way of life, rather than continue to search for the

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<sup>5</sup> Significantly, this exact notion was presented at a recent working conference on water law in South Africa in the paper presented by Francis Wilson (1998). Refer to the website [www.uct.ac.za/org/rssa](http://www.uct.ac.za/org/rssa).

<sup>6</sup> This argument is highly politicized and is seen from the perspective of a developing world to be a rigid freezing of the economic inequalities that exist between the North and South, to the benefit of the North. In effect, this argument is about a post-industrialization phase, when large parts of the developing world are in fact almost pre-industrial in terms of their own economic development.

“good life” (Eckersley, 1997: 14). Other writing from this time also echoes these sentiments. For example, Richard Barnet (1980) wrote as follows:

“The specter of the hungry mob supports Hobbesian politics, a world of struggle over inadequate resources that cries out for Leviathan, the authoritarian state that can keep minimal order. The Malthusian fantasy offers an alternative to the Leviathan state. There is no need for a civil authority to regulate scarce goods, because Nature, cruel only to be kind, periodically thins the surplus population by famine.”

Another example of the literature from this period was that of Robert Heilbroner’s (1974) somber inquiry. This portrayed the only hope for the survival of mankind as being the obedient rallying behind a centralized, authoritarian state, thought to be the only form of institution that would be capable of extracting the types of sacrifices that would be needed to regulate distribution and redirect the economic sectoral outputs of agriculture and industry along more ecologically sustainable lines (Eckersley, 1997:14). It must be added however, that whilst Heilbroner saw the centrally planned, authoritarian state as being a necessary transitional scenario to the post-industrial economy, it is clear that this is not what he personally would have wished for. Instead, he supported the notion of a state that was diminished in scale from the dangerous level of gigantic nation-states towards a form of ‘polis’ along the lines of ancient Greece (Eckersley, 1997: 15).

William Ophuls (1973) is also representative of this school of thought. In this author’s view the world is confronted with a limited choice between either “Leviathan or oblivion”. Significantly, both Heilbroner’s and Ophul’s view of man seem to share the same characteristic of the herdsmen found in Hardin’s *“The Tragedy of the Commons”* as selfish hedonists who rationally seek private gain. This establishes a direct philosophical link to the self-interested human who roamed in both Hobbes’s and Locke’s *State of Nature* (Eckersley, 1997: 15). In the case of Hobbes, they are seen as being in perpetual conflict with the interest of the larger social community, whereas in the case of Locke, they are in intermittent conflict with these broader interests (Eckersley, 1997: 16). Thus the survivalist school can be understood in terms of being a form of new eco-social contract theorists. The new “ecological contract” is based in terms of the Hobbesian premise of scarcity and would therefore require an all-powerful Leviathan to enforce it. In other words, if citizens did not voluntarily surrender certain freedoms, then restrictions would have to be externally imposed by a sovereign power.

The survivalist school essentially asked whether socialism was ecologically salvageable or not, thereby contributing two distinct intellectual aspects to the debate on political ecology (Eckersley, 1997: 17). These are as follows:

- ✳ They have drawn attention to the seriousness of the overall ecological crisis that exists.
- ✳ The authoritarian solutions which emerged as the result of *“The Limits to Growth”* debate encouraged a search for a deeper cultural transformation along with

alternative, non-authoritarian institutions that would foster a more co-operative response to the environmental crisis.

The third phase of political ecology thinking resulted from the criticism of the authoritarian solutions that were being offered by the survivalists. The response was to push the limits of the eco-political debate beyond the realm of the physical limits to growth, up to the point where the very notion of material progress was being questioned (Eckersley, 1997: 17). In terms of this thinking, there were a number of social and psychological costs that were associated with the dominance of instrumental rationality such as alienation, loss of meaning, the coexistence of extremes of wealth and poverty, dependence on welfare, dislocation of tribal cultures and the growth of an international urban monoculture with a resultant loss of cultural diversity (Eckersley, 1997: 18). Some examples of writing from this time illustrate this train of thought. William Leiss (1974) wrote:

“No elaborate argument should be necessary to establish that there are some limits to economic and population growth. But everything depends on whether we regard such limits as a bitter disappointment or as a welcome opportunity to turn from quantitative to qualitative improvement in the course of creating a conserver society.”

Other authors such as Rudolf Bahro (1982; 1984; 1986) wrote along the lines that the environmental crisis had arisen as the direct result of the “quintessential crisis of capitalism”, which had now forced society to reexamine not only the psychological costs of competition, but also the expansionary ethos of our materialist culture and imperialist attitude to other living species (Eckersley, 1997: 19). Yet another author, Christopher Stone (1974), used the opportunity to enquire whether the environmental crisis had not offered an opportunity for the metaphysical reconstruction and moral development of mankind. To this end, Stone wrote:

“whether we will be able to bring about the requisite institutional and population growth changes depends upon effecting a radical shift in our feelings about ‘our’ place in the rest of nature. ... A radical new conception of man’s relationship to the rest of nature would not only be a step towards solving the material planetary problems; there are strong reasons for such a changed consciousness from the point of making us far better human beings.”

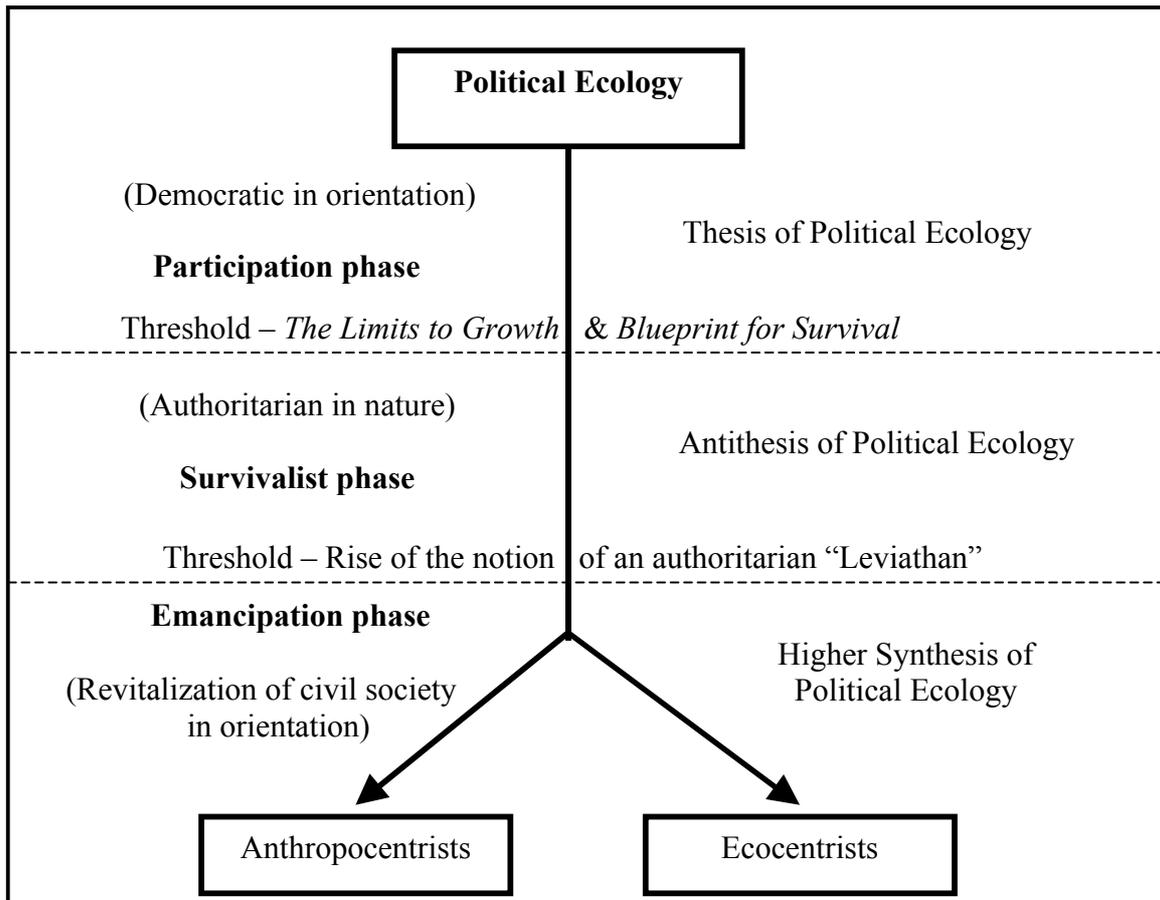
The significance of the emancipatory school to the overall debate on political ecology is essentially threefold (Eckersley, 1997: 19-20). Their contribution is as follows:

- ✳ The environmental crisis is now regarded as being a crisis of culture in the broadest sense of the meaning.
- ✳ Emancipatory ecopolitical theory may be understood as challenging the then prevailing political ecology discourse and widening its agenda on three distinctly

separate but interrelated levels; human needs, technology and self image. Significant to this is the whole debate over the appropriateness of technology for example.

- ✳ They have directed considerable attention towards the revitalization of civil society rather than, or in addition to, the state. As such they are focussed on integrating the concerns of the ecology movement with other emerging activist groupings such as those dealing with feminism, peace and the Third World aid and development issue.

This whole debate can be better understood when it is represented in a diagrammatic form. This is done in Figure 1.



**Figure 1. Schematic representation of the various phases in the development of political ecology philosophy showing the currently prevailing two schools of thought.**

This summary of the trend in political ecology thinking is useful, as it enables the focus of the rest of this paper – the spatial and temporal maldistribution of water and its relationship with the spatial distribution of the human population – to be developed further in the context of Southern Africa, against this philosophical background. It is to this endeavour that we now turn.

## ISOLATING THE VARIABLES:

If one performs an analysis of Southern Africa, one is immediately confronted by two significant factors. These relate to precipitation and people, and it is the interaction of these two fundamental variables that essentially underpins the developmental dilemma of that specific region. Let us look at these in a little more detail.

- ✳ **Precipitation**<sup>7</sup> is the first fundamental variable of which four distinct aspects are important. The first three of these are generally of a greater importance than the remaining two for the purposes of this paper however. Firstly, there is a marked spatial maldistribution of water, with a distinct latitudinal and longitudinal trend. There are generally higher precipitation levels in the north, decreasing progressively to the south. Superimposed onto this, there are also higher levels of precipitation in the east, decreasing dramatically to the west. Secondly, there is a temporal dimension to this maldistribution of water. This means that rainfall tends to be distinctly seasonal in pattern, but these seasons vary greatly over time. Thirdly, there is the volume aspect. This means that the amount of precipitation that falls is subject to a high degree of variation. These three elements combine to cause a reasonably high level of stochasticity in the overall precipitation patterns. This has significant implications for aspects such as crop planning, surface runoff, soil erosion and river flows. These factors in turn impact on water management because it means that large storage reservoirs<sup>8</sup> have to be planned and built because the reliability or predictability of the precipitation patterns are of a low order of magnitude. The less important aspect of precipitation (at least for the purposes of this paper) is water quality, which is generally of a reasonably high standard except in certain specific areas where acid rain falls. Eutrophication and salinization do occur in impoundments due to the return flows of effluent and evaporative losses however.
- ✳ **People** are the second fundamental variable of which three aspects are important. Firstly, there is a spatial distribution of people in Southern Africa that is generally at variance with the availability of water. In other words, population distribution tends in general to be concentrated in areas that are far from supplies of water. Secondly, there is a significant temporal aspect to the population base in the sense that the whole of Southern Africa generally has a very high population growth rate. Thirdly, there is the aspect of migration patterns. This is a complex issue in its own right. Suffice it to say, for the purposes of this paper, that there are population migration pull-factors and push-factors. Pull-factors are aspects such as perceptions of better

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<sup>7</sup> For the purposes of this paper, the variable called "precipitation" will be taken to mean water in whatever form it is found in the hydrological cycle. This is not strictly in accordance with other definitions of precipitation. Essentially, the water found in the lower Zambezi River that is being allocated to the generation of hydro-electric power in Mozambique, is the same water that fell as precipitation (in the strict hydrological sense of the word) over the highlands of Angola.

<sup>8</sup> This in itself is a problem due to the prevailing levels of evapotranspiration. For example, evaporation from Lake Kariba accounts for 20-25% of the annual flow of the Zambezi River at that point (Sir. Mott Mac Donald & Partners, 1990:2.7). Evaporation from the Omatako Canal, a component of the Eastern National Water Carrier (ENWC) in Namibia, accounts for 70% of the water carried by this scheme at that point (Davies *et al.*, 1993: 163). For more details of other schemes refer to Turton (1998: 67).

job opportunities in the larger urban areas, which tend to be focussed on places like the Gauteng area of South Africa (which significantly is on a high plateau, far from water supplies and facing a significant water shortage as a result), Gaborone in Botswana, and Harare and Bulawayo in Zimbabwe (both on a watershed and with unique water supply problems of their own). Migration push-factors are aspects such as the loss of livelihoods due to overpopulation, poverty, declining levels of land per capita (which is significant for a subsistence farming economy) and drought.

This leads logically onto the third fundamental variable. If the water is concentrated in areas that are spatially distant from the population centres, then effectively what needs to happen is to bring the water to the people (or vice versa). This is where the heart of the political ecology dilemma lies. In order to move water over long distances **pipelines**<sup>9</sup> are employed. For the purposes of the political ecology discourse it is these pipelines that make the debate lively. Because pipelines bring life-giving and job-creating water to areas where the demand for water is high, they perform a function that can be regarded in its broadest sense as being allocative. In short, pipelines allocate a given volume of water to a specific spatial entity. It is precisely this allocative aspect of pipelines that results in the next variable, **power**<sup>10</sup>. In its crudest form, power<sup>11</sup> is derived from the privilege or the relative advantage<sup>12</sup> that the receiving entity derives from having been favoured over the non-receiving entity. Seen in this way, pipelines become conduits of power because they allocate water from an area of relative abundance, to an area of relative scarcity. The water so allocated therefore has an economic cost, whether this aspect is actually reflected in the final price that is charged for the water or not; and the water so allocated results in a relative advantage of one form or another.

Having isolated these four fundamental variables – **precipitation (Pr)**, **people (Pe)**, **pipelines (Pi)** and **power (Po)** - it now becomes possible to construct a model (or series of models) that reflect the different relationships that each has, relative to the configuration of the other. This enables a distinct political ecology discourse to emerge.

### **ANALYSIS OF THE RELATIONSHIPS BETWEEN THE VARIABLES:**

As a point of departure, let us accept that the fundamental developmental problem in Southern Africa at a strategic level is the need to reconcile the spatial differences that exist between:

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<sup>9</sup> It must be noted that the term ‘pipeline’ is being used in the widest possible context. Huge projects such as the Lesotho Highlands Water Project tend to transfer water from one river basin to another. Strictly speaking, it is incorrect to assume that the water stays in pipelines for the entire distance of the transfer. Normally the water is pumped via pipeline either over a watershed, or through a mountain (by tunnel) until the next river basin has been reached, where the water is discharged into the receiving river. For this paper, the variable called ‘pipeline’ will be used to mean any form of water transfer scheme, be it reservoir, canal, tunnel or pipeline.

<sup>10</sup> Bryant (1993) offers a useful conceptualization by stating that “power is reflected in the ability of one actor to control the environment of another”. This will be used as a definition for purposes of this paper.

<sup>11</sup> Refer to Bryant & Bailey (1997: 38-47) for a more detailed analysis of power vis-à-vis political ecology.

<sup>12</sup> In India, for example, water distribution in irrigation systems is regarded as “an inherently political activity” (Mollinga & van Straaten, 1996).

- ✳ The availability of water which we have said is the variable called **precipitation** and given it the abbreviation **Pr**.

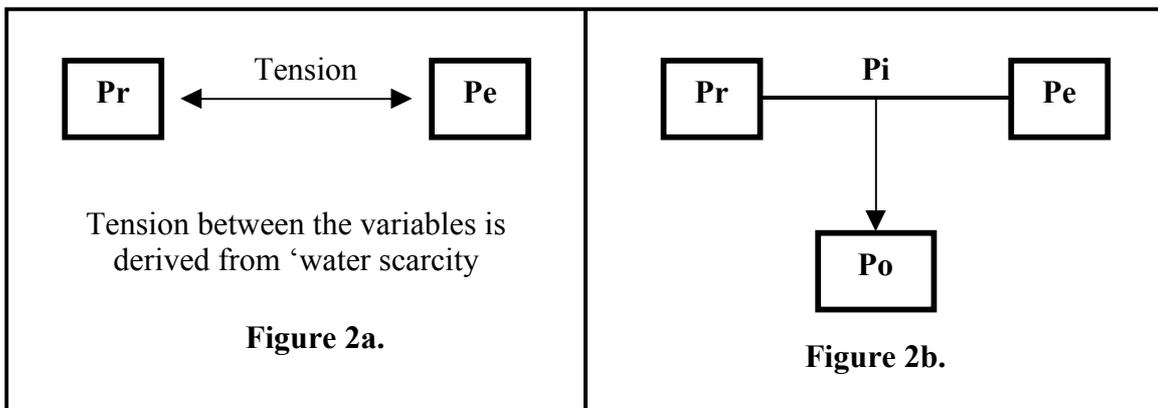
- ✳ The population which we have called **people** and given it the symbol **Pe**.

In addition to this, for the purpose of the argument, we have stated that there are two other fundamental variables:

- ✳ The engineering systems that are used to bridge the spatial gap that exists between the variables **Pr** and **Pe**. This technological system we have called **pipelines** and we have given this variable the symbol **Pi**.

- ✳ The relationships that the decision-making structures in society have vis-à-vis the other variables we have called **power** and assigned it the symbol **Po**. The reason why this variable is important is that a plethora of power relationships exist - far too many for them all to be covered in this analysis - that are relevant to the other three fundamental variables. These will become more apparent once we start examining the different relationships.

Having isolated these four variables, we can now examine the relationships that exist in different configurations. As a point of departure, it becomes evident that if a disparity exists between **Pr** and **Pe**, then tension exists between these two variables. This tension can be operationalized by using the concept of 'water scarcity'. This is shown diagrammatically in Figure 2a.



**Figure 2. The relationship between the two variables, precipitation (Pr) and people (Pe) are different when a pipeline (Pi) is brought in to reduce the tension by alleviating 'water scarcity'. From this a complex power (Po) relationship is derived.**

The tension created as the result of this 'water scarcity' has a number of ramifications. For simplicity, let us assume that the existence of a 'water scarcity' will have a negative effect on the livelihoods and economic potential of the social group that occupies the spatial entity that is experiencing the scarcity. Coming directly from this tension called

‘water scarcity, a power (**Po**) relationship is apparent. This is derived from either the existence of an engineering solution (**Pi**) or absence thereof. The existence of a pipeline will alleviate the tension that is derived from ‘water scarcity’ and will thus increase the relative advantage of the spatial entity that receives the new additional flow of water. The converse is also true. This is illustrated in Figure 2b.

The existence of a pipeline will in turn depend on a process of decision-making (as well as other factors such as economic capacity etc.,) that gives the pipeline an inherent power aspect. This power has both positive and negative connotations.

- ✳ In a positive sense, the existence of this pipeline can advantage the group of people that receive the water. This can impact positively on their daily livelihoods and can be manifest in terms of relative economic prosperity, health and wealth. To this end, Bryant & Bailey (1997:39) note that the objective in this regard may simply be to monopolise a valued environmental resource, so as to ensure that the economic benefits associated with this resource accrues largely, if not exclusively, to the actor (or the constituency) concerned.
- ✳ In a negative sense, the absence of this pipeline can disadvantage the group of people who occupy the spatial entity that is experiencing ‘water scarcity’. This is manifest, for example, in the fact that women and children spend large amounts of time and energy fetching and carrying water, impoverishment, disease and the absence of economic development opportunities<sup>13</sup>. This marginalization of a politically weaker group of people can leave them vulnerable to other environmental changes of an episodic nature, thereby exposing this group of people disproportionately to the risks that are incurred by the powerful actors’ attempts to monopolise the benefits (Bryant & Bailey, 1997: 40) associated with that resource.

Therefore, the act of deciding to develop a pipeline has profound political ramifications, which can be used by a political elite to advantage themselves. Within an overall setting of general resource scarcity, a powerful elite can entrench their dominant position by deciding to build pipelines that advantage specific sectors of society, and disadvantage others. This is called a process of ‘resource capture’<sup>14</sup>. An example from Southern Africa can be found in Apartheid South Africa where major engineering solutions were brought into existence to advantage the white minority<sup>15</sup>, at the expense of the black majority. In

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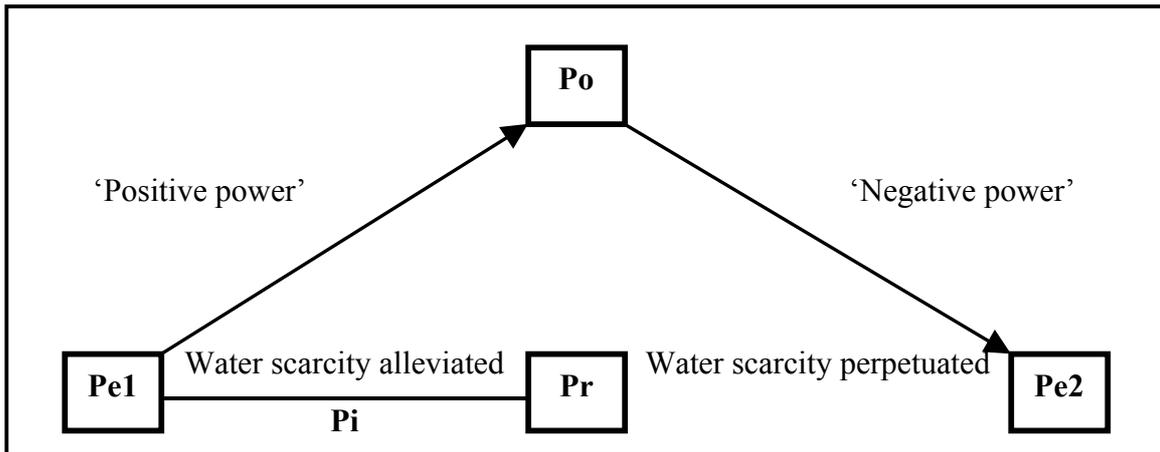
<sup>13</sup> The lack of water is a barrier to sustainable socio-economic development; and the lack of development is a barrier to solving water problems (Lundqvist & Gleick, 1997: viii). The latter is seen to be a form of ‘social resource scarcity’ (Ohlsson, 1999:161). In the case of Apartheid South Africa, this ‘social resource scarcity’ was deliberately imposed onto the economically weaker majority as a form of power or control.

<sup>14</sup> Acknowledgement is given to Thomas Homer-Dixon and the Toronto Group for this concept (Homer-Dixon & Percival, 1996).

<sup>15</sup> Abrams (1996) notes as follows in this regard: “One of the main contributing factors to this ethos [of unrealistic public assumption] is the pricing of water and the legal framework which defines certain water as “private” and is based on the riparian rights principle. This, *together with the political requirement to retain the support of the white farmers who owned most of the land in the country*, has led to water being seriously undervalued and there being a general lack of conservation awareness in the country” (emphasis added). This supports the central thesis that pipelines “bought” support for an illegitimate regime. This legal basis has now changed with the advent of the South African National Water Act (36/98).

this sense water became profoundly political. It can therefore be seen that the decision of the previous minority Nationalist Party Government to build certain pipelines and not others, had a distinct impact in terms of power, in that it tended to advantage one social group in general. In specific terms, this favoured one economic sector – agriculture<sup>16</sup> – because this was a political constituency that was important for the maintenance of that specific regime at that moment in time. Conversely, the agenda of the new democratically elected ANC Government, has dictated that water will now be given to the previously disadvantaged areas. One of the significant components of the Reconstruction and Development Programme (RDP) is directly linked to the development of pipelines to take water into previously marginalized spatial entities. By doing this, against a background of the existence of a finite water resource<sup>17</sup>, this has both political and economic ramifications and is likely to impact on the very social fabric of South Africa in a profound way in the near future.

Let us examine these variables in a little more detail by constructing a hypothetical model. In this model, the notion of power can be explored in greater detail by showing how it is derived, or where it impacts, in relation to the overall configuration. Let us assume that a spatial entity has conditions of water scarcity in general. Within this spatial entity, there are two social groupings of people, which for explanatory purposes will be denoted as **Pe1** and **Pe2**. This is shown schematically in Figure 3.



**Figure 3. Schematic representation of two forms of power relationships that can result from the politics of pipelines.**

Against the background of water scarcity, the decision-making entity could choose to alleviate the water scarcity within one specific community (**Pe1**) and not in another (**Pe2**). This will in turn advantage that community (**Pe1**) economically and socially. In return for this “privilege”, there is likely to be an increase in support for the decision-

<sup>16</sup> Conley (1997) gives a detailed explanation of the changes in the South African water law, placing irrigated agriculture in a broader context of political change.

<sup>17</sup> The notion of a finite water resource is somewhat restrictive, and the use of the concept dictates that no other water is available. It will be shown later in the paper that this is not true, and that alternative sources of water do exist, provided that the decision-making elite adopts a new water paradigm.

making entity that “flows” from the constituency in what can be understood as ‘positive power’. This ‘positive power’ can be in the form of votes, taxes, patronage and goodwill. In turn for this support, the decision-making entity can use this power in a negative sense. This ‘negative power’ can be in two distinct forms.

- ✳ A subtle power<sup>18</sup> can be understood as existing as long as the water scarcity<sup>19</sup> is perpetuated. This will undermine the economic and social potential of the given spatial entity or constituency, and can be used as an instrument for marginalization and disempowerment, which in turn translates into a form of control.
- ✳ A more brutal form of power<sup>20</sup> can also be exerted over the specific spatial entity or constituency in the form of government supported harassment. It can be argued in this context that the funding for such activity is derived from the flow of power in the form of political support from the constituency that has been advantaged. This links the notions of ‘resource capture’ and the resultant economic disempowerment to ‘ecological marginalization<sup>21</sup>’ in a direct causal way.

The above conceptualisation could in fact be used to explain what happened in South Africa before the 1994 democratic elections<sup>22</sup> specifically with regards to the agricultural sector. One implication of the ownership of water through riparian rights was the fact that water tended to be misallocated in the economy. The following statistics are revealing in this regard (Turton, 1998a: 143). In 1980, 54% of the total water consumed in South Africa went to the agricultural sector, which in turn contributed a mere 6% to the GDP. In contrast, the industrial sector consumed 11% and contributed 45% for the same year. During 1990, agriculture consumed 52% of the total water and contributed 6% to the GDP, whereas industry consumed 13% while contributing 31% to the economy during the same year. During 1995, agriculture consumed 72% of all of the water while still only contributing 6% to the economy, whereas industry consumed only 11% while contributing 30% to the GDP for the same year. The conclusion that can be drawn from this data series is that agriculture is inefficient at converting scarce water into a contribution to the overall South African economy (Turton, 1998b) and that the farmers were in fact privileged as a result of this favorable allocation.

The black majority became increasingly marginalized over time, often being forced into less productive parts of South Africa which came to be known as the “Bantustans” or

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<sup>18</sup> The French word for power as “*pouvoir*” is useful to explain the distinction of subtle power in the form of control.

<sup>19</sup> This is where the work being done by Ohlsson (1998) is so valuable. It is based on the concept of ‘social resource scarcity’ which is more subtle than mere ‘water scarcity’. It explains the spiral of disempowerment that comes into play within a community that is living under conditions of constant water scarcity. Ohlsson’s work fits neatly into the political ecology discourse and adds value to it in a Southern African context. It also helps to explain the political ramifications of water in an impoverished society. Refer to Turton (1999c) where Ohlsson’s work has been developed further.

<sup>20</sup> The French word for power as “*puissance*” is useful to explain the distinction of brutal power in the form of force or might.

<sup>21</sup> Refer to Homer-Dixon & Percival (1996) for a more detailed explanation of this concept.

<sup>22</sup> Refer to Turton (1998b) for more details of the South African case of ‘resource capture’.

“Homelands”. Not only did blacks suffer from an imbalanced distribution of the quantity of land, but they also often received the most marginally productive land (Percival & Homer-Dixon, 1995:8) which contributed to structural scarcity. Land rights and water rights were linked however, so scarcity of one meant scarcity of the other too. These relatively depleted pieces of land were seldom consolidated into cohesive units. Onto this patchwork quilt of land, large populations were forced to live. In fact, Apartheid ultimately forced the majority of the population to live on just 13% of the total land area (Homer-Dixon & Percival, 1996:39), largely without access to clean running water. For example, during 1994, a survey conducted in rural KwaZulu-Natal revealed that 76.2% of the population in that specific survey area only had access to water from springs and streams, none had taps in their homes, 15% made use of communal standpipes, 1.6% had access to reservoirs and 7.1% had no access to safe potable water at all (Percival & Homer-Dixon, 1995:12). This resulted in severe environmental degradation, some of which may well be of an irreversible nature – all of this while the white community, farmers in particular, were being taken care of by the government of the day.

In fact, it can be taken one step further and used to explain why the major shift has taken place within the South African water sector since 1994. Assuming this hypothesised explanation to be the case, then it becomes possible to develop a plausible explanation why water demand management could not be introduced prior to 1994, and conversely why demand management was introduced after that date. Using political science terminology, it becomes possible to show that the minority government was in effect an oligarchy. This form of government is generally unpopular and consequently faces an endless barrage of challenges<sup>23</sup>. Central to this dynamic interaction is the notion of ‘legitimacy’. Restated within a political ecology form of discourse, an illegitimate regime will need to “buy<sup>24</sup>” support because by definition it only has a minority support-base. This is done in the form of allocating natural resources (by deciding to build pipelines to alleviate water scarcity) in such a way as to advantage<sup>25</sup> a given constituency and to disadvantage<sup>26</sup> another. In other words, this allocation of scarce resources is by definition inefficient, but these inefficiencies are regarded as being expedient by the regime because this is the price it has to pay for political support. Because water demand management is designed to improve efficiencies, it goes contrary to the underlying logic inherent within the paradigm of minority political rule. Demand management also tends to be unpopular, so any threat of the further erosion of regime support will be deliberately avoided. Conversely it can be argued that a legitimate government with broad-based, popular

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<sup>23</sup> See Turton & Bernhardt (1998) for a detailed explanation of how threats to the regime were perceived and dealt with at that time.

<sup>24</sup> This is where the value of the concept of positive power becomes significant. The reader is again referred back to footnote number 15 where Abrams (1996) is quoted as saying that, “*the political requirement to retain the support of the white farmers who owned most of the land in the country*” was an issue in water supply, which is likely to have long-term repercussions.

<sup>25</sup> This can be used to explain why the full economic cost of water is not charged under such conditions. It is the cost of buying political support. This in turn leads to sectoral inefficiency.

<sup>26</sup> Here the concept of negative power becomes relevant.

support, can in fact introduce demand management<sup>27</sup> schemes, as the regime under these conditions is not under constant threat.

It can therefore be said, that in hydropolitical terms, just as water is needed by people to sustain life, engineering solutions like pipelines are needed to sustain governments under conditions of water scarcity. The metaphor can be continued further. Just as water flows down a pipeline, power flows too – the latter is just a little more difficult to detect and quantify. But are pipelines the only solution, or is this solution not imposed by a particular paradigm? It is to explore this question further that we now turn our attention.

### **VIRTUAL WATER: AN ALTERNATIVE PARADIGM:**

For purposes of clarification let us recap where we have been. This paper started off by discussing political ecology. In terms of the philosophical foundation of the political ecology debate, it was shown that there has been the emergence of a new school of thought. This new school of thought is based on the fundamental notion of ‘ecological sustainability’ and it says that if the world carries on as it has been going, then there is likely to be a collapse of the global ecological system, with dire consequences for the entire planet. The other pole of this debate was based on the fundamental notion of ‘economic growth’. We will return to this in a moment. This paper then went on to examine some of the variables that existed in the water sector. It was suggested that in fact four variables exist in a fundamental sense of being reasonably universal in their manifestation. These variables were defined as the spatial maldistribution of water (operationalized as precipitation), the spatial maldistribution of humans (operationalized as people), the engineering solutions that were needed to address this maldistribution (operationalized as pipelines) and the various forms of socio-political ramifications that were derived from political decision-making (operationalized as power).

Returning now to political ecology, the two concepts, ‘ecological sustainability’ and ‘economic growth’ can be understood to be linked in a dialectic that emerged from the “sustainable development” debate of the 1980s. The thesis of the dialectic is being driven from the developed world, which is calling for ‘ecological sustainability’. This impacts in a direct political sense on the developing world because it does nothing more than entrench the existing relationship of inequality that exists between the North and South. Thus the antithesis is ‘economic development’ if viewed from the perspective of the developing world.

It therefore becomes prudent for purposes of scientific enquiry to examine the possibility of a synthesis between these two poles<sup>28</sup>. This synthesis can be based on a paradigm of ‘virtual water’ in the opinion of the author. This is illustrated in Figure 3.

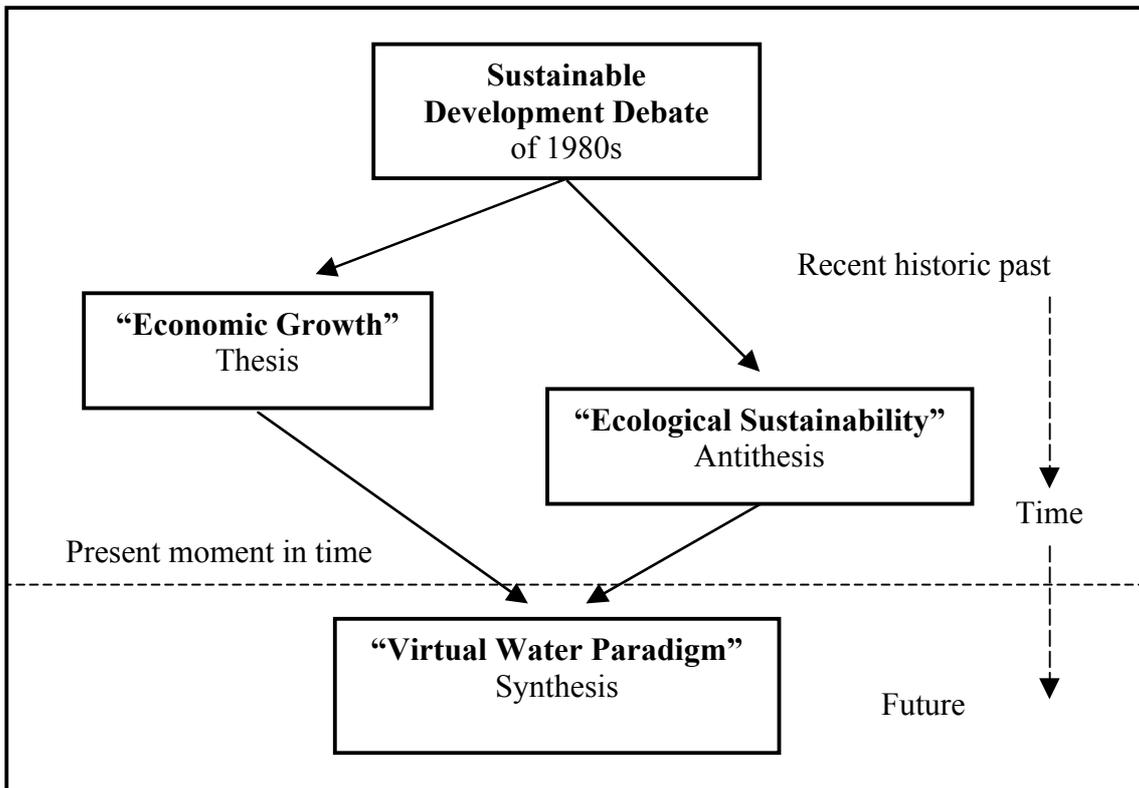
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<sup>27</sup> This adds a new dimension to demand management that explains why demand management cannot be the sole responsibility of economists or engineers. It is a social and political issue too (Turton 1999c). Political ecology as a discourse allows these separate specialist disciplines to come together.

<sup>28</sup> These two poles only exist within a paradigm that ignores the water that is found in soil. This is by far the most important part of the water endowment of a country, but is generally ignored because it is almost impossible to quantify (Tony Allan: personal communication with the author on 13 January 1999).

The following argument to support this view is offered for consideration by the scientific and policy-making community in Southern Africa.

- ✳ This debate between ‘ecological sustainability’ and ‘economic growth’ is being driven by the developed states of the North.
- ✳ At the heart of the debate lies a search for the post-industrial society. This is at direct odds with the needs of the developing world, which is hampered in many cases by the existence of forms of pre-industrialisation.
- ✳ This debate is therefore likely to be perceived by decision-makers and activists, as being to the exclusive benefit of the North, at the direct expense of the South. The issue is thus likely to be placed on the North-South agenda in a more vociferous way in future. This is already evident in the form of “green conditionality” whereby donor agencies use environmental goals as a form of leverage over national governments (Leach & Mearns, 1996: 23).



**Figure 3. Schematic representation of the emerging environmental dialectic, showing “economic growth” and “environmental sustainability” as being at two poles, with “virtual water” being suggested as a viable alternative option.**

The time is consequently ripe for the consideration of an alternative water sector policy. Indeed, a number of states are currently involved in so-called water sector reforms, which shows that the existing policies are no longer appropriate<sup>29</sup>.

Let us examine aspects of the suggested ‘virtual water’ paradigm in order to determine if it merits future consideration as a viable alternative, by starting off with a definition. Virtual water is the volume of water needed to produce a commodity or service (Allan 1996a). Typically it takes around 1 000 tonnes of water to grow one tonne of grain. This represents the ‘virtual water’ value of grain. ‘Virtual water’ is also present in hydroelectric power and constitutes the volume of water needed to produce a given unit of electricity. The important point about ‘virtual water’ is that it manages to harness the most valuable portion of the water endowment of any given state – the soil moisture – which normally cannot be quantified or valued. The logic<sup>30</sup> for a ‘virtual water’ paradigm is developed as follows:

- ✳ Whereas there are many examples of water scarcity at a local or regional level, there is not a water scarcity in global terms. Vast quantities of water do in fact exist in certain parts of the world.
- ✳ This surplus water is found in the soil moisture of grain exporting states. Significantly, these states have an abundance of natural precipitation, and the governments’ concerned often subsidise the farmers to grow for the export market. This means that relatively cheap water can be imported in the form of grain.
- ✳ It is therefore easier, and less ecologically destructive, to import one tonne of grain than to pipe in 1 000 tonnes of water.

The choice comes down to a policy option between two poles.

- ✳ If the government of a semi-arid region decides to adopt a policy of national self-sufficiency in food, then it means that large quantities of water will be needed for the agricultural sector. This could be called the “more crop per drop at whatever cost” option. It has been shown (Turton, 1998a) that agriculture has a low return to water than industry for example. Therefore to achieve a national-self sufficiency goal, it logically means that water will have to be located and mobilised for this purpose. There will be a cost for this in political, economic and environmental terms. Against the background of the current political ecology discourse, this will be increasing viewed in a negative sense by the powerful states of the North. This in turn can be reflected in trade negotiations, foreign aid packages and financial support.

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<sup>29</sup> There is a global shift away from the notion of national food self-sufficiency to one of national food self-reliance. The ultimate goal is to grow sufficient food to meet the world’s needs, and to deliver that food to wherever it is needed (Lundqvist & Gleick, 1997:22).

<sup>30</sup> Refer to Allan (1996b) for a detailed analysis of ‘virtual water’ with respect to the way that it has helped the Middle East and North African (MENA) states balance their water budgets.

- ✳ Conversely, if a government opts for a policy of national self-reliance in food, then it does not need to mobilise water for agriculture in the physical sense. It can rather use its existing water for industrial purposes, where it has been shown (Turton, 1998a) to have a higher rate of return. This could be called the “more jobs per drop at reasonable cost option”. Significantly, this would free up the water budgets of many states and would impact positively in the form of reducing water scarcity.

So, pipelines and their associated engineering support systems, can be understood as being the “hard option”, falling into the category of ecological unsustainability, whereas ‘virtual water’ can be seen as the “soft option”, falling into the category of economic growth within the bounds of environmental sustainability. This is important, given the fact that currently the political ecologists (who criticise pipelines as being ecologically disruptive and therefore unsustainable) have as yet developed no alternatives to “sustainable development” (Bryant & Bailey, 1997: 4). Virtual water is thus a viable synthesis for the prevailing ecological dialectic in the opinion of the author. What are the ramifications of this in a Southern African context?

At this moment in time, a number of water transfer schemes are underway in Southern Africa. They are becoming ever more complex and costly as the only available water becomes ever more distant. In fact, in strategic terms at present, the only significant water that is still available for exploitation is found in the Zambezi and Zaire Basin. Some of the major projects that are currently under way include:

- ✳ The Lesotho Highlands Water Project (LHWP) captures the headwaters of the Orange River in Lesotho and re-directs it to the industrial heartland of South Africa via the Vaal River sub-basin. The return flow is back into the Orange Basin. The first water has started to flow already and additional phases of construction are being considered that will almost double the volume of supply.
- ✳ The North-South Carrier (NSC) in Botswana is nearing completion. Most of the pipes are in the ground and smaller aspects such as pump stations and valve chambers are being finished off. The overall length is in the order of 350 kilometres and it will harness the water from the Moutloutse, and later the Shashe River, in the Limpopo Basin, taking it down to Gaborone. The source of supply is the Letsibogo Dam that has been completed and is currently filling up, albeit slower than was anticipated.
- ✳ The Eastern National Water Carrier (ENWC) in Namibia takes water from a number of sources including ground and surface water found in the north east of the country, down to Windhoek in the centre.

In addition to these projects that already exist, there are a number of new projects being planned. These are likely to become highly emotive as some of them already are. In most cases, the author is of the opinion that sophisticated international special interest groups such as environmental NGOs, are likely to put increasing pressure onto foreign donors not to support the projects. These projects include:

- ✳ The Matabele-Zambezi-Water-Project (MZWP) is being planned to take water from the Zambezi River just below Victoria Falls. It is likely to be very costly due to the operating head and resultant energy costs needed to pump the water. As a result, its logic is being linked to the development of the Batoka Gorge Dam that will reduce the head while providing the energy needed for the pumping. This in turn means that Zambia is going to be drawn into a debt situation for a dam that they have no need for, and that will actually divert water away from themselves and therefore be to their own detriment. Zambia is in fact deriving foreign currency from ecotourism that is based on the white water rafting below Victoria Falls, which is of a world class. This will be lost if the dam is built. The author is currently doing some research aimed at determining if this pipeline will in fact be linked to the NSC in Botswana, as they are spatially very close together. If this happens, the throughput will be higher making the economics different and possibly more attractive. This is an extremely complex issue in hydropolitical terms, and one that is likely to become very emotive. Research is difficult because no respondent is prepared to be quoted due to the sensitivities.
- ✳ The Namibian government has announced its attention of developing a pipeline from the Okavango River (Turton, 1999b; Ramberg, 1997). In addition to this it is mooting the possibility of developing a hydroelectric scheme at Popa Falls on the Okavango River. This is causing some unease in Botswana and is likely to be vociferously opposed by environmental groupings. There is already a coalition of such NGOs working under the name of the Okavango Liaison Group, which is functioning within a political ecology framework. There are some unconfirmed reports that planning is underway to develop a major pipeline from the Zaire Basin down to Namibia.
- ✳ The Namibian government is in an advanced planning stage for the development of a dam at the Epupa Falls on the Cunene River. Two sites are being considered – the Baynes and Epupa sites. There are complex political dynamics around this whole project that are beyond the scope of this paper. One specific angle is linked to the inundation of the traditional ancestral burial sites and grazing land of the Himba people. Current arguments against the project are distinctly being propagated in a political ecology framework.

Pipelines and their associated politics of power represent what can be described as the *realpolitik* of water. ‘Virtual water’ and its associated political ramifications of power, represent a softer option to the problem of the spatial maldistribution of water and people, that is based on a consensual and accommodative style of political decision-making, using the notion of “some, for all, forever<sup>31</sup>”. If serious research is done within the framework of political ecology thinking, it may be found that the above-mentioned projects may not even be needed, if the rationale of a ‘virtual water’ based development strategy is considered as a viable alternative. Researchers will need support however - this is the underlying rationale for this paper - as this endeavour is likely to take them into

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<sup>31</sup> Full acknowledgement is given to Prof. Kader Asmal, the South African Minister of Water Affairs and Forestry, for articulating this so eloquently in Cape Town on 11 November 1998.

areas where the sanctioned discourse (also referred to as ‘public transcript’<sup>32</sup>) would have us believe that the water sector is not the domain of the social scientist, but rather the engineer and the hydrologist.

### **TOWARDS A POLITICAL ECOLOGY BASED RESEARCH AGENDA:**

It has been shown that the current state of political ecology thinking, if left as it is and taken to its logical conclusion, will result in a sharp polarisation into two distinct groups – those calling for “ecological sustainability” and those calling for “economic development”. A ‘virtual water’ option offers a viable alternative in the opinion of the author, embracing the best of both poles. If this is to be accomplished, a serious research agenda needs to be formulated. The following are some suggested areas of interest:

- ✳ The existing definition of ‘virtual water’ is too crude and abstract. This needs to be made more specific and capable of being operationalized and quantified in economic, social and political terms.
- ✳ Is virtual water based on international trade in water-rich products that are produced by industry for example? If so, then what of the poorer developing states that lack the capital to harness their water surplus<sup>33</sup> and sell it as ‘virtual water’, or the foreign currency surplus with which to buy ‘virtual water’? Is ‘virtual water’ based on the trade of cereals? If so, then what is the significance of this option in cultural<sup>34</sup> terms? If there is a cultural preference for local grains, how will this impact on the viability of a ‘virtual water’ policy?
- ✳ Is virtual water based on the trade of agriculturally derived products that harness the valuable soil moisture? If this is so, then the rationale of exiting policy options change significantly. For example, selling beef from Botswana is tantamount to exporting the valuable soil moisture of the Kalahari in the form of meat to the water-rich European Union, in much the same way that exporting oranges from Israel was. The Israeli policy has subsequently been reviewed<sup>35</sup> in light of a ‘virtual water’ approach. If the focus is on agricultural products, then what is the economic significance of exporting ‘virtual water’ in hydroelectricity from the Zambezi River rather than building pipelines?

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<sup>32</sup> Refer to Bryant & Bailey (1997: 42) for more details on the relevance of this.

<sup>33</sup> Zambia, Angola and possibly Mozambique are examples of states with a water surplus.

<sup>34</sup> It has been shown (Lichtenthäler, 1999) that “cereals are not only central but absolutely essential to Yemeni cuisine. Importantly, the perceived social and cultural values of some home grown varieties – of which 25 are known for sorghum alone – and their distinct place and function within Yemeni daily life, explains the strong preference for local grains over foreign imports. Moreover, homegrown cereal foods, especially at lunch, are believed to enhance the daily and socially significant *qat* chewing experience in the afternoon. *Qat* is a narcotic stimulant chewed by the majority of Yemeni men in the company of friends and relatives. The production and consumption of home grown cereals strengthens social values and notions of identity”.

<sup>35</sup> Refer to Feitelson (1998) for a detailed study of how a window of opportunity made this politically possible.

- ✳ Within the context of Southern Africa, what will be needed at the political level to use ‘virtual water’ to stimulate intra-regional trade, which is currently hampering the economic integration of SADC states? For example, could a specific policy be developed that would mobilise the water surplus found in Angola and Zambia, and allow this to be used to supplement the water deficits of states like Namibia, Zimbabwe, Botswana and South Africa?
- ✳ Is a ‘virtual water’ based developmental strategy sufficient to allow for a dialectic synthesis between the thesis of ‘economic growth’ and the antithesis of ‘ecological sustainability’?

## CONCLUSION:

What is abundantly clear to the author is that there is a global dynamic that is currently shaping the economic future of all developing states. This is operating within the framework of a North-driven notion of ‘ecological sustainability’. Now is the opportunity, to mobilise the scientific and research community, in an effort to determine the relative advantages and disadvantages inherent within any strategic developmental option that is chosen. We are moving into unknown territory – we are crossing an invisible threshold<sup>36</sup> into a new paradigmatic frame of reference - where existing knowledge can no longer offer us sufficient assurance that the policy choices being considered are the best ones. The overall framework of political ecology provides a fertile research ground for multidisciplinary. The world is complex. It is the fragmentation into specialised disciplines that has muddled the way that humans understand how the world works. Political ecology can be used to reconcile these differences by providing a road map that can steer policy-makers on that difficult to navigate course, balancing precariously between the political complexities of the need for economic growth and the precipice of ecological collapse.

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<sup>36</sup> Turton (1999b) cites an example of the subtle intrusion of political ramifications into the “normal” domain of engineers and hydrologists. This involves the decision to build a pipeline from the panhandle of the Okavango Delta. Normally it would be the realm of engineers to make such decisions, and certainly within the sovereign competence of the Government of Botswana to do so. Yet suddenly, an upstream riparian decides to build a pipeline and the whole issue becomes one of international politics (Refer to Ramberg, 1997). From that moment onwards, political factors became as relevant as any engineering equation to the development of that pipeline. An invisible but important threshold has been crossed. The politics of pipelines has been thrust upon us. Where are the social science specialists who can provide insight to such complex decision-making? Are they even allowed to sit in International River Basin Commissions where such issues are thrashed out? The answer at this stage is an emphatic no, because the prevailing paradigm is that water is the exclusive domain of engineers, hydrologists and possibly freshwater ecologists. Refer to Turton (1999c) to see how this changes over time. Significantly, political ecology thinking says that this need no longer be the case. The sanctioned discourse or ‘public transcript’ is being challenged.

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This paper will attempt to contribute to a deeper understanding of the social dimension of water scarcity and social stability by developing some key concepts further, and then by suggesting a tentative model that can be considered for empirical testing in various social settings. Conceptual Origins The whole aspect of the social side of water is a relatively new field of study.