

The Beacon

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1 Introduction

For humans considering sewerage, the Beacon is that technology that achieves this task with zero water, needs zero energy, kills all the pathogens and recycles all the nutrients. This is understandable and measurable to humans but also fills all sustainability requirements. It would be technology perfection when viewed with a Resource Management Act lens if it were manufactured.

However, in information space the Beacon holds a particularly special place arising from four elements of its derivation: its roots are in Nature (the fundamental laws and processes (FL&P)), zero is at the end of the set of positive numbers, zero is the slope of the first derivative at the minimum (and maximum), and zero is the best that is possible in terms of many sustainability criteria.

The Beacon uses all these attributes, but there are two components that make it useful for human functioning: its location in information space being outside of all human constructions; and the beam. The beam can be considered analogously with a lighthouse beam – it cuts through the murk to indicate a useful location. The measurements mentioned above that make the Beacon understandable in the human context, attach to the beam. But it is the location in information space (as captured in the mathematics that can be applied to the FL&P) that is most useful for the development of new technologies.

Using zero in the definition of the Beacon in effect links all the different contexts to which zero applies – the sustainability context supplies the zeros to the mathematical context which creates the ‘location’ which is then linked via the numbers context to create the ‘beam’ which is then able to access the human brain as zero has meaning to us.

In this location any technology can be compared to the Beacon and rated using measurement and number theory. Similarly any *new* technology can be rated against the Beacon and its usefulness as a contribution to moving towards more sustainable technologies rated outside of industry standards. The usefulness of the Beacon to councils, communities and commerce is noted but these are discussed in more detail in other papers (Chapman, 2014b).

The Beacon can be an agent of change in moving the industry to more sustainable technologies.

2 Zero in different contexts

Whether it be number theory, mathematics, sustainability or human language, zero is a term that retains its meaning irrespective of the context in which it is used.

- Zero = 0 in number theory. It is between the positive and negative set of numbers. Measurement uses numbers.
- In mathematics, the procedure for finding minimums and maximums is to find the first derivative and set it to zero.
- In the human context, words that are synonymous with zero such as: absent, zilch, none etc. mean the absence of anything.

Because it retains its meaning across contexts, zero is particularly useful when used in the sustainability context.

2.1 Zero in the sustainability context

If we were to measure the most sustainable possible technology for dealing with our 3 waste streams then it would be one which needs: zero water, zero energy, and has zero pathogens. Even recycle of all nutrients could be interpreted as zero nutrients to receiving waters – the measure of environmental effects.

This is equivalent to the mathematical minimums that are needed for sustainability: take the first derivative of the assemblage of fundamental laws and processes (FL&P) and set it to zero.

With the linkage to language, then these sustainability zeros can be used in the public dialogue. The zeros have meaning to everyone, even those not trained in mathematics.

If it were possible to build such a technology then there would be nothing that could be more sustainable. It is an absolute limit to what is possible with our waste streams to minimise human impact on this planet.

3 The Beacon

The Beacon is the construct that carries the usefulness of the zeros discussed above into the social domain. The term Beacon is used because of its analogy to human constructions such as a lighthouse that guides shipping (the same analogy can be used if an electronic beam is used rather than the light beam of the traditional lighthouse). These navigation aids have two useful components that can also be used analogously within the context as used in this paper: a location and a beam.

To derive the Beacon, take the mathematical context of minimisation and use it on an assemblage of the FL&P **before** they are formulated for a particular technology. As Nature (whose behaviour is captured in the FL&P) was doing Nature's thing before humans existed on this planet, then this assemblage of FL&P are also outside of all human systems. The *result* of the mathematical minimisation is consequently outside of all technologies. We can ask, and get an answer to “what is the most sustainable possible technology”? This is the most powerful of the definitions of the Beacon, as the result of the minimisation(s) can be used to design new types of technologies.

This derivation of the Beacon defines its ‘location’; that is the sustainability zeros in information space outside of all human constructions. However the ‘beam’ arises from the number context: the zeros are quantitative (and consequently measurable) meaning a pass/fail test for any technology is unavoidable, unarguable, and unable to be affected by politics. Being common to all of the contexts noted above, then using the zeros in the definition also links all these contexts – the sustainability context supplies the zeros to the mathematical context which creates the ‘location’ which is then linked via the numbers context to create the ‘beam’ which is then able to access the human brain as zero has meaning to us.

Being common across so many contexts then using zero in the definition of the Beacon means that this definition also crosses into these other contexts. By way of example, the same point in information space is arrived at by measurement (numbers): does the technology need energy or water, where are the nutrients and how many pathogens are present?

3.1 The Beacon in Information space

The beam attribute of the beacon is particularly useful in the theoretical perspective being argued in this series of papers. The notion of a ‘wall of complexity’ that arises when Nature is used in human technologies is suggested (Chapman, 2014b). One consequence of this ‘wall of complexity’ is that current human use of Nature in our technologies is based largely on a set of constraints that bear little resemblance to the ‘best possible technology’, but is strongly influenced by human qualities such as: difference from others (useful for marketing), or profit. Or to use the wastewater industry example, a series of historical situations (fashion – the wealthy were the first to use *water closets* and others aspired to these; stench – solved by putting the sewage into underground pipes; disease – resulting in ‘end-of-pipe’ treatment stations). In each of these situations with sewerage, the solution being sought was to solve the identified need (eliminate stench to use an early example). With this priority there is little ‘space’ for the: “is this the best possible technology?” question, as the approach to Nature is made with pre-formed notions as to the issues for which a solution is required. For example, odour is only one part of the ‘best possible technology’ and any odour problem can be solved **without** giving due weight to the other components of ‘best’ such as zero energy use and zero water use.

It would be hard to find a technology ‘problem’ for which the analysis did not begin with some sort of human bounds; yet Nature was doing Nature’s thing long before humans existed, so we shouldn’t need to begin with a human bounded analysis.

The Beacon can serve the role of challenging these human bounded assumptions. As it is common to so many disciples, then comparing the performance of any technology to the Beacon provides a linkage between the information held in the Beacon (the minimised FL&P) on the Nature side of the ‘wall of complexity’ and human comprehension of Nature. For example, solving an odour issue with increased energy is **not** moving towards a more sustainable technology.

The Beacon can be viewed as **tunnelling** through this wall of complexity. Strictly speaking, the Beacon ‘carries’ Nature through the wall on the back of the sustainability zeros. This is a state that occurs in the information realm at the zero point. The information carried by this linkage differs from our experience (or indeed our measurement) of Nature.

This linkage can be used in many ways to move society towards sustainable technologies. These are explored in more detail in the papers of this series (Chapman, 2014a).

4 Uses for the Beacon

As the Beacon is outside of all human constructions then it can be used to critique the performance of any incumbent technology. This attribute was used to get an answer to whether the flush toilet can be a component of sustainable sewerage technologies – it failed (Chapman, 2015a).

- **Councils.** As the Beacon satisfies all requirements of the *purpose* of their governing Act (Resource Management Act 1991) then councils can use the Beacon in many roles to fill their obligations under their Act:
 - Encourage adoption of those technologies that are closest to the Beacon – which, by its derivational roots contains all of the sustainability zeros and includes nutrient recycling. Incremental adoption of nutrient recycling technologies can be shown to have better long-term environmental outcomes than minimum discharge standards (Chapman, 2015b).

- Consider non-coercive mechanisms based on proximity to the Beacon that can be an alternative to minimum discharge standards to effecting change. In this case, there is the potential to form an information link to a community's culture that can sit alongside the coercive mechanisms of rules and regulations (Chapman, 2014b, p. 9).
- Inspirational. As the zeros are accessible to the human mind individuals who have concerns for the environment may choose a technology that is closer to the zeros of the Beacon. This establishes information linkages to the mechanisms of change in human societies (Chapman, 2015b, p. 9).
- **Communities.**
 - Sustainability was given a high priority in Glenorchy's community planning process in both 2001 and 2015. Using the Beacon, any council proposed scheme can be judged against the degree that it saves energy, encourages use of less water, and enables recycling of nutrients. People's use of the term sustainable often bears little relationship to the clear intent of the Act and any misuse of the term can be challenged by reference to the Beacon.
 - Mechanisms to reduce the 'gap' between *where we are* and *where we could be* can be better targeted as the Beacon is *where we could be*, and enables quantification of the 'gap'. These numbers contain pointers to the best mechanisms for effecting change that will reduce the 'gap'.
- **Commerce/engineering.**
 - The minimised FL&P that define the Beacon's location can be solved within a range of limits including public health, material constraints etc and the resulting technology judged against normal commerce constraints such as: manufacturing costs, customer acceptability, reliability etc. Commerce can aspire to the Beacon and reap the financial returns if they are successful.

5 Conclusion

The Beacon holds a special place in information space arising from four elements of its derivation: its roots are in Nature (the FL&P), zero is at the end of the set of positive numbers, zero is the slope of the first derivative at the minimum (and maximum), and zero is the best that is possible in terms of many sustainability criteria.

It is the commonality of zero in these different contexts that makes this derivation of the Beacon useful. In particular, zero has meaning in the language context enabling the use of the Beacon in the social domain. In this context it becomes very useful as it attaches to the purpose of a council's governing Act. Nature can have a voice in the council board room and consequently a means of expression via our laws.

6 Bibliography

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