



Sense in the City
June 18, 2006

The Dinosaur, the Runaway Train and the House of Cards: A Study of the Human Factors in Bio-Security in the Global Village

World Planners Conference, Vancouver, June 2006

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Abstract

The design for a Bio-Security system for zoonotic diseases in the urban environment, requires a consideration of the “human factor”. The modern city is a complex of geological-biological-zoological-noetic- infrastructural systems. Where aspects of the country, including intensive agricultural production, are included within city limits, the containment and management of zoonotic diseases demands the recognition of an ecology of human players, and disease factors. The multiple perspectives of individual, industry groups, bio-experts and three levels of government across national and international jurisdictions, make the human factors involved highly complex. Furthermore, a multiplicity of human values influence motivational factors in each human interest system. This brings into play a plurality of human systems boundaries, structures and relationships and creates endless opportunities for disconnections and breaches of any bio-security system design. Effective avian flu management strategies will encompass multiple human values, motivations, roles, relationships, responsibilities and accountabilities. Lessons are derived from the avian influenza experience in 2004 in the Central Fraser Valley, BC. Suggestions address the human factor through education, industry leadership, animal-human health expertise and systems development.

Bio-Security as an Indicator of Progress?

Ronald Wright in “A Brief History of Progress” cites Joseph Tainter’s images of social collapse: the Dinosaur; the Runaway Train and the House of Cards.

In February, 2004, I watched in amazement, as a hundred feet below my residence on the edge of the Agricultural Land Reserve, in the city of Abbotsford in the Central Fraser Valley, the avian flu spread westward, from one farm to over 200 farms. The phenomenon seemed to defy all the considerable expertise of the poultry industry in the most intensively farmed area of North America. But though it was obvious to me that the pattern of distribution was based on the valley’s distinctive air shed, such observations by “ordinary citizens” and/or meteorologists were initially ignored. With all due respect for the experts trying to do the best job they could, the process they used resembled “dinosaurs” tracking the spread of the virus, who failed to recognize until too late that the disease was probably spreading via the air venting systems in the chicken barns and wild birds. The maps charting the disease-spread, displayed the typical air patterns visible to anyone who understood air pollution maps in the Fraser Valley.

In February 2004, the Deputy Minister, Ministry of Agriculture, Food and Fisheries (MAFF), faced a “runaway train”. On February 19, 2004, the Canadian Food Inspection Agency (CFIA) confirmed the highly pathogenic avian influenza virus was in the Central Fraser Valley. Lead responsibility for identification, control and eradication of foreign animal diseases in Canada rested with the Canadian Food Inspection Agency (CFIA). However, engagement by the industry (initially omitted from the decision making process), provincial and local governments was vital for a successful outcome, because the immediate impacts of an outbreak on animal and human health and on the economy (to the tune of twenty million dollars per week), were felt at the local level. Moreover, a great deal of support was needed from local health and agriculture authorities and industry to deal with a disease outbreak (Hamilton, 2004a).

Mary Reeves (2004), Mayor of Abbotsford, during the 2004 avian flu outbreak, tells stories about the players in the city’s poultry industry. The Mayor’s stories reveal a food production industry that Tainter and Wright might recognize as a “House of Cards”.

- a) She talks about owners of backyard flocks, taking personal risk and responsibility to save their birds by attempting to move them to escape the bird cull in the Fraser Valley by transferring them on the ferry to Vancouver Island.
- b) She reported the need to support laid off workers who have lost their pay cheques for the foreseeable future.
- c) She shared her frustration at the delay in having the situation declared an emergency – noting the mayor’s dilemma of governing a city which has no jurisdiction regarding avian flu. The city is totally dependent on the provincial and federal jurisdictions.
- d) She went to bat with federal authorities to obtain harm reduction payments on behalf of the producers when federal authorities invoked flock cull orders (for 17 million birds).
- e) She supported changes to federal legislation that allowed the survival of poultry processors by importing product for processing from the US.
- f) She related her frustration at trying to get public health authorities to cooperate and respond to public information needs in a timely way.
- g) She visited producers, processors, workers and remained a visible presence in the city at the start, the peak and the post-contagious phase of the outbreak.

This is an inquiry into preventing Runaway Trains (spread of disease), “re-intelligencing” Dinosaurs (industry and government) and renovating the poultry industry Houses of Cards. It is also a quest for developing resilient capacities related to Bio-Threats in the Global Village.

A Brief History of Human and Animal Settlements

Any design for a Bio-Security system for zoonotic diseases in the urban environment, requires a consideration of the “human factor”. Human behaviour is complex, fractal, developmental, adaptive and emergent (Hamilton, 2006). Over 100,000 years of human history demonstrate progressive complexities have emerged in human biology, psychology, culture and social systems. (Beck and Cowan, 2005; Wright, 2004). This means that people make choices to act or not act for different reasons, based on values, ethics, social systems and economic rewards.

Multi-disciplinary science has taught us that human systems have evolved in response to ever-changing life conditions. Each turn on the evolutionary spiral has produced a coherent set of values systems that represents what is important to people. In terms of levels of complexity, so far, eight major values systems have emerged, each more complex than the one preceding it, each transcending and including what has come before (Hamilton, 2005b; Beck et al, 2005; Wilber, 1996). Out of each of these human values systems, governance, production and distribution infrastructures have emerged that reflect the requisite levels of social and cultural complexity (Beck et al, 2005). The core values of the eight values systems can be seen in the human players of the avian flu incident:

1. Individual safety and survival of family members on family farms
2. Bonding and family relationships within farm sectors with shared customs, norms and ways of communicating
3. Individual expression and personal power of producers and processors in their “empires”
4. Order, authority, rules, laws, bylaws, ordinances and infrastructures of the various bureaucracies and governance systems
5. Organization, efficiency, effectiveness, strategies and results of the entrepreneurial enterprises in the poultry industry
6. Community, diversity, and social safety nets of the national supply management network and animal health activists
7. Whole systems thinking and ecological webworks of environmental and corporate socially responsible citizens
8. Global worldviews and shared world meshworks of the World Health Organization (WHO)

In the last three hundred years, by enforcing our values and developing our infrastructures, we have developed three major economic strategies. The economies arise from the values, cultures and infrastructures that have come to dominate governments, business and Non-Governmental Organizations (NGO’s). In terms of the poultry industry, these strategies can be summarized as follows:

- a) **Competitive Demand Economy**, characterized by the efficiencies of bird yields (eggs and meat); inputs (water, feed, shelter). The metrics for this economy include returns on inputs, results, reported incidence of disease. The key driver is the market. This is the primary strategy of the American industry.
- b) **National Supply Managed Economy**, characterized by maximizing farm-gate revenues, bird yields (eggs and meat); and minimizing inputs (water, feed, shelter). The metrics for this include revenues per producer, outputs per bird, barn, farm, region.. The key driver is producer peers. This is the primary strategy of the Canadian industry.
- c) **Global Economy**, characterized by the relationships of agricultural production to local and global life conditions and ecology. The metrics for this include quality of life, balance of human and animal health factors. The key driver is the greater good of all life. This is an ideal strategy practised by a few specialty producers.

The modern city is a life container for individual values, human social systems and economic exchange. As such the modern city is a complex of geological-biological-zoological-noetic-infrastructural systems adapted to support human life in the particular ecologies where they are located (Eddy, 2003). Cities have arisen in all of earth's seventeen ecological habitats (Fernandez-Armesto, 2002). Each habitat creates the life conditions, where the boundaries of city survival are constantly negotiated with the surrounding environment (Wright, 2004).

As cities grow they tend to overtake and overbuild their agricultural food production zones, displacing them outside city limits. When cities become densely built up in their cores, there is generally no room for agricultural activity. But in the eco-zones between fully built-up urban environments and their suburbs, and/or in small cities and/or in certain cultures, agricultural production still operates within city limits; eg. Seattle suburbs (a friend raises backyard chickens); Abbotsford, BC where 75% of the land mass is agriculture and protected by Agricultural Land Reserve legislation; many European and Asian cities, where live birds are regularly sold in farmers' markets .

With modern population increases, accelerating urban in-migrations and intensive agricultural practices with larger factory type farms, the density of food production facilities increases with every year. This is measurably visible in the Central Fraser Valley, where every year more major stretches of the Matsqui and Sumas Prairies are going under greenhouse glass and chicken barns.

Where such aspects of the "traditional" countryside permeate the city, including intensive agricultural production, the containment and management of zoonotic diseases needs to take into consideration an ecology of human players with mixed values, infrastructures and economies. The spectrum of human systems contributes a multiplicity of vectors to the challenge of managing zoonotic diseases. If we overlook the complexity of human systems, we will undermine our capacity to respond to the disease spread.

What is a zoonotic disease?

A zoonotic disease (ZD) is one that is originally endemic to animal populations that can spread to human populations. Examples include HIV/Aids, SARS, Ebola, West Nile Virus, BSE, Avian Flu. ZD's tend to be contagious, self-organizing, complex, natural phenomena, capable of learning, adapting (aka mutating) and traveling great distances. Not all ZD's become pandemics – but where they have broken out they have tended to cause serious epidemics. However, some ZD's have clearly changed history by causing pandemics (such as the 1918 Spanish flu, and the medieval bubonic plagues). We can consider some ZD's as special mutations that are totally adapted to humans in a particular habitat but not in others; for instance, many Europeans developed an immunity to small pox (originally derived from cow pox) and when they arrived in the New World the virus decimated whole nations (such as the Sto:Lo nation of the Fraser River) who did not have the natural antibodies to survive. Such is the Runaway Train of ZD.

With such virulent indications, why are many (though not all) Health Organizations and officials becoming less concerned about zoonotic diseases? (In trying to do their job with the linear paradigms of statistics and predictability curves, rather than the non-linear probability and complexity meshes, are they in danger of becoming Dinosaurs too?) It seems that it is easy to be apathetic about ZD's because not all will become pandemics. But because of their viral nature, and their attraction to preying on other living systems in receptive ecologies that the ZD's deem to be hospitable, they can never be underestimated.

As already noted, human systems have bio-psycho-cultural-social characteristics. ZD's attack the biology of individual human systems and as they spread they engage the psycho-cultural-social capacities of human systems. If they become sufficiently contagious and widespread, ZD's can bring the total bio-psycho-cultural-social human system of a city crashing to its knees – such as SARS threatened to do to the city of Toronto in 2003 (clearly another example of a Runaway Train incident).

Prevention, containment, management, and immunity to zoonotic diseases demands the recognition of the ecology of the animal disease factors as well as an ecology of human players. Other conferences like Western Poultry Disease Conference (2005) look at the conditions of the animal factors. This paper is looking at the conditions of the human factors.

Human Factors – What's Important?

In the poultry industry, human systems include individuals, industry groups, bio-experts and three levels of government across national and international jurisdictions. Each of these human systems exists at a different scale. Each brings a certain set of bio-psycho-cultural-social perspectives. This makes the human factors involved highly complex -- and a veritable House of Cards – situated within the four quadrants of the bio-psycho-cultural-social human condition. Figure 1 shows how seven (of the eight) values systems for the city of Abbotsford are nested (and massively interconnected) within each of these quadrants (Wilber, 1996; Wilber, 2003; Hamilton, 2005b).

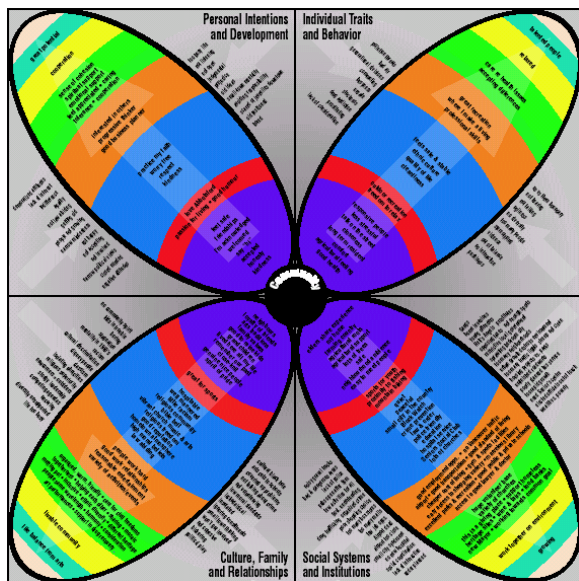


Figure 1: Four Quadrant Abbotsford Values Map: Upper Right=Bio; Upper Left=Psycho; Lower Left=Cultural; Lower Right=Social.

The multiple perspectives related to our system of interest, the urban food production system (and specifically the poultry industry) can be located in these quadrants (known as an all quadrants, all levels approach or AQAL) (Wilber, 2003):

- a) (UL) includes Individuals: Producers, Processors, Workers, Distributors, Retailers, Consumers

- b) (UR) includes Bio-experts: Veterinarians, Medical Doctors, Nurses, Micro-Biologists, Laboratories (Local, BC, CA, WHO), Animal Health (CAHC)
- c) (LL) includes Industry Affiliated Groups: 4 Feather Groups, Commercial, Free Range, Backyard Breeders, Hatcheries, Marketing –Provincial, National
- d) (LR) includes Government Agencies: City, Ministry Agriculture Food & Fisheries, Health Ministries, Provincial Emergency Preparedness, CFIA, WHO

For each of these quadrants, the full set of eight values systems are simultaneously in play (see examples in Appendix A) along with the natural system of ethics which protects what is important within each values system (Beck, 2002).

1. Family circles physically protect the safety and survival of family members.
2. Clan and tribal unions use “family farm and/ or good old boy” agreements to preserve traditional ways.
3. Top down empires use the law of the jungle for immediate and impulsive rewards to further self interest such as producer quotas and prices.
4. Authority driven hierarchies (bureaucracies) command with rules to do what they consider is right, such as protecting supply managed commodities.
5. Entrepreneurial enterprises use the rules of the game to win any competition, such as the processors’ strategy to survive using foreign supply.
6. Social justice networks consider the relative needs of the collective in service of the common good, such as supporting the social fabric for families in need.
7. Systemic webworks take personal responsibility to integrate processes and flows, such as thinking about corporate and industry social responsibility.
8. Global meshes serve the entire living system with a sense of collective individualism, taking into consideration the global interconnectedness of the ecology and global distribution/transportation systems.

Thus we can see a plurality of human system values, ethics and structures within the boundaries of the city, where the complexity of relationships creates endless opportunities for disconnections and breaches of any bio-security system design.

Animal systems (Zoonotic) and Human Systems (Zoo-noetic – from “nous” to consciously know) are inextricably interconnected across these boundaries, thus setting up potent conditions for bio-security breaches and threats. Animals and human interfaces occur at animal scales (such as: Bird, Barn, Farm, Region) and at human scales (such as Person, Family, Neighbours, City, Eco-shed, Region). Moreover, the science of zoonotic disease, tells us that multiple combinations of viral “mixing vessels” (aka poultry, equine, swine, humans) offer an ever-dynamic choice of environments for viral production.

Is One Size Fits All A Suitable Strategy?

As noted above, the multiple players in the poultry industry use three basic economic strategies to bring their produce to market. When we use the four quadrants and eight levels as lenses to examine strategies for the management of avian flu, we see a spectrum of motivational factors influencing the various players. Table 1 lists the players in the industry and identifies their key values drivers, based on what each group values and considers most important.

Table 1: Plurality of Human Values Related to Avian Flu

Players	Key Values Drivers
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Producers	Level 5: Ownership, Economic
Producer families	Level 1: Health, Safety
Workers	Level 4: Pay cheque; Level 1: Safety and Survival
Processors	Level 5: Ownership, Economic
Processor Workers	Level 5: Pay cheque; Level 1: Safety and Survival
Animal Health Pros (Vets)	Level 2, 5, 6: Quality Animal Health; Level 5, 7: Professionalism
Poultry Industry Associations	Level 5: Economy; Level 4: Standards
City	Level 1: Health; Level 4: Safety; Level 5 Economy (Tax)
Province	Level 1: Health; Level 4: Safety; Level 5 Economy (Tax)
Federal (CFIA)	Level 1: Health; Level 4: Safety; Level 5 Economy (Tax); Level 6/7 Trade

During the outbreak of avian flu in Abbotsford in 2004 , the major management strategies for avian flu ranged from use of antibiotics, surveillance, boundary management, declaration of emergency measures, and culling of the flock. Given the Supply Side Economic strategy in place in Canada, what got measured (the loss of production and revenues) got noticed, in order to protect the supply managed system (another Dinosaur??). This one size fits all approach marginalized both non-standard players (like backyard flock owners) and access to available but unused information (like observations of ordinary citizens or expert knowledge outside the system of interest). While the factory farms survived, “some of the smaller farmers did not recover and [sold] out their [production] quota” (Reeves, 2006).

It is a matter of record that the DM of MAFF attempted to organize a strategic approach to prevent a reoccurrence of avian flu. Like the Mayor he too was faced with the conflicting drivers of the human systems. While he was able to kick start the policy development and change implementation process within his own ministry, he was not able to coordinate or motivate the efforts amongst the poultry producers or other provincial or federal jurisdictions. (Because the industry was not initially involved in the decision making processes, much confusion arose that still exists, even though they responded when asked to do so (Reeves, 2006). Many issues are still not resolved and are still cycling through the halls of our bureaucracies. The question is, can we afford to use a dinosaur strategy to stop a runaway train?

In comparing notes with other jurisdictions around the world who have had to cope with recent outbreaks of zoonotic disease (BC Ministry of Agriculture, Food and Fisheries; The Four Feathers Group; Canadian Food Inspection Agency; Agriculture and Agri-Food Canada. (2004), we learn that AQAL options are also vital to manage the animal and disease issues including:

- Developing Bird Resilience (Canadian Animal Health Coalition (CAHA))
 - Caring and respecting the life conditions of living systems
 - Preventing stress
- Creating and Maintaining Bird Health (Netherlands)
 - Researching
 - Experimenting

- Continual surveillance
- Developing Relationships and Communications
 - Connecting all stakeholders ahead of time (Texas Avian Flu Story)
 - Preventing system burnout (Toronto SARS story)
- Developing Healthy Industry Systems
 - Co-relating animal health systems with human health systems
 - Preventing system burnout (SARS story; NL)
 - Scenario Planning (CAHA)

How do we design effective AI Strategies?

It would appear then that the AQAL views help to disclose a much more comprehensive global understanding of zoonotic and zoo-noetic factors and options (ie. we can use the AQAL analysis to look at both disease and human strategies). Our experience now tells us that to have a sustainable food production industry, we must attend to the conditions of sustainability for both the food source and the human systems producing and consuming it. It appears the ultimate measure is our own survival (Wright, 2004).

Thus, in order to improve the chance of survival in the global village, the questions, we need to ask ourselves are: “Do we measure food (chicken) production output to respond to human consumption demands and/or human profit demands? Why don’t we measure human population/food production in relation to the carrying capacity of the land?” In other words are we examining the underlying factors that can actually challenge the basis on which we produce the food that creates the bio-threat? (Are we willing to survey the conditions on which our House of Cards is built?) The answer to these questions will ultimately be the proving ground of our decision sets for sustainable food production.

Until we find the answers to this deeper inquiry, we propose that it is at least safe to say that no one strategy can work everywhere to prevent, control or manage avian flu in the urban setting. Clearly with the number of human factors we have identified, one size never will fit all.

Recent research following an outbreak of Exotic Newcastle Disease in California concluded that “Producers may underestimate human factors related to biosecurity ... and Biosecurity must remain an ongoing process on a premises [ie. location by location] basis” (Castellan, 2004).

Other research with a variety of agents in the health system, reveal that neither professionals nor the general public are well informed about issues or strategies for surviving pandemics in human health systems (Ginger, 2005a, 2005b).

By comparing the debriefs and learning outcomes from the outbreaks of various zoonotic diseases, and reviewing these research findings on human system readiness, it appears that one tactic everyone agrees on is that it is important to recognize and enable the interconnection of all the players in the system so they can see the whole system in action. The Ginger Group (2005b) further identifies that the “power of we” can release a capacity to respond to pandemics; that human system capacity needs to be engaged at the level of ordinary citizens; that diverse perspectives expand the capacity of the system to respond; that response-ability can be enabled through forums of multiple stakeholders; that informal leadership within the community needs to be tapped; and that partnerships need to be initiated prior to any event,

Essentially, the strategies for human health in the face of zoonotic disease can be summarized in the AQAL quadrants.

- **(UL) By enabling Individual Awareness** which includes Mental, Emotional, Spiritual health. This can be achieved by developing Professional Ethics within the food production industry; by peer coaching, so that producers coach producers in best practices and personal accountability; by counseling those who have been and/or are most likely to be affected; and by establishing an agricultural industry Hot Line
- **(UR) By providing Individual Support for human Bio-Physical Health Responses** through: Public Health Agency Symptom Tracking; Health Professional Surveillance & Reporting ; developing vaccines and conducting vaccination where possible; systematic Medical Healthcare; quarantining as required; Laboratory Testing & Reporting; and developing, implementing and enforcing Food Safety Procedures.
- **(LL) By Developing Corporate Social Responsibility (CSR), Relationships & Communications** by: tapping citizen responsiveness; enabling cross-sectoral informal/formal partnerships; establishing Agricultural Sector and Corporate Social Responsibility Ethics (CSR); developing and industry CSR Surveillance Planning & Reporting System; customizing Industry Communication Plans for: Commercial, Free Range, Specialty and Backyard flocks; creating Medical Advisories and Alerts within an AQAL framework (including Regional Health Surveillance & Reporting, Symptom Reporting Line & Tracking, General Public Website, Phone Line, Medical Healthcare Support Line; creating a Multi-Provincial AQAL ERP Communications Plan with both the ministries of MAFF and Health; developing a national ERP AQAL Communications Plan – with both the CFIA and CEPC; and through the engagement of Professional, Social and Church Support.
- **(LR) by Legislating Government and Agency Response** through: developing and applying an Agricultural Sectoral Social Ethic; establishing plans for - City Biosecurity Response Plan, MAFF – Biosecurity, Health Agencies & Ministries – Human Health Response, PEP – Zoonotic & Zoo-noetic ER , CFIA – Food Safety, Zoonotic ER, and WHO - Zoonotic ER. All of these plans need to be coordinated, shared and continuously connected and updated.

In summary, bio-security in the Global Village depends on meshing Human Success Factors, much like Mayor Reeves and the DM of MAFF attempted to model in Abbotsford in 2004. Human success factors are generated from attention to a meshwork of AQAL strategies. These include:

- (UL) Ethics, Learning, Education for
 - Producers
 - Consumers
 - All AQAL players
- (UR) Access to Biological / Health Expertise
 - Animal
 - Human
 - Global/Local scopes
- (LL) Developing Community and Industry Leadership for:
 - Community responsiveness and resilience

- Corporate Social Responsibility Framework
 - Setting global standards for preventing and responding to zoonotic diseases
 - Creating global relationships
 - Planning Communications Strategies for all Stakeholders
- (LR) Developing Systems Approaches for
 - Partnering
 - Applying / Monitoring CSR
 - Farm Management
 - Agricultural Systems
 - Human Health Care Systems
 - Governance Change
 - Developing Accountabilities for Processing, Distribution

Bio-security in the Global Village depends on integrating the zoo-noetic success factors with the zoonotic resilience factors. This will prevent or reduce the potential social collapse that can be generated by the complex interconnections of Runaway Trains, Dinosaurs and Houses of Cards.

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Appendix A: Examples of City Values Systems

The values and ethical systems of a city can be disclosed by asking people what they think is great about it, what is blocking its growth and what they envision to improve it (Hamilton, 2005b). An example is the values map of Abbotsford, where the responses showed a characteristic pattern across the values systems (see Figure 1).

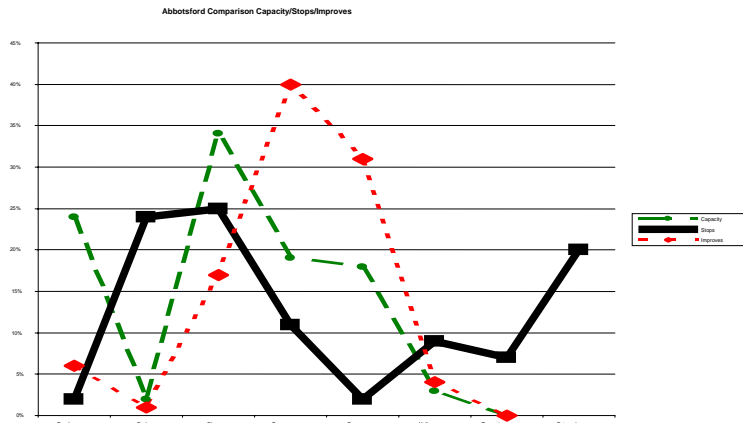


Figure 1: Comparative Values Map of Abbotsford (7 levels)

The relative weightings of city values systems can be disclosed both by ordinary citizens and sapient circles. Figure 2 represents the values map of Vancouver and Figure 3 shows the values map of the three cities in Cascadia: Vancouver, Seattle and Portland as mapped by sapient circles.

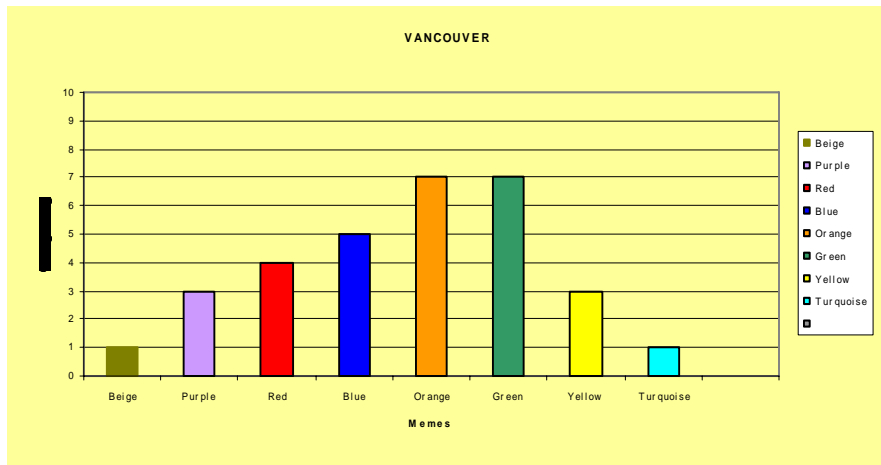


Figure 2: Values map of Vancouver (7 levels)

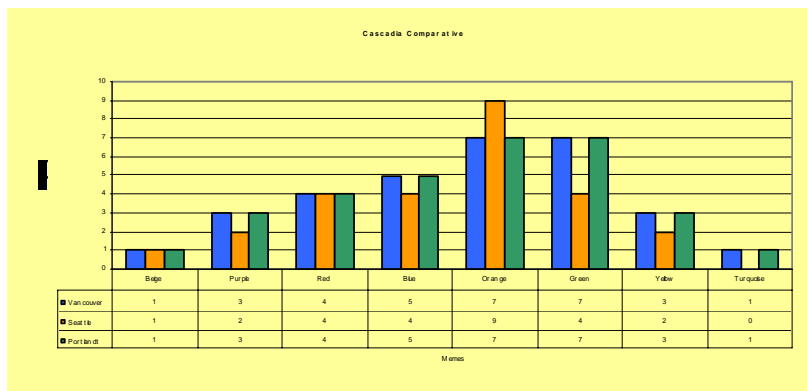


Figure 3. Comparative Values Map of Cascadia Cities: Vancouver, Seattle and Portland (7 levels)