
Forum: The tale of garbage composition

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Biographical notes: Manfred Fehr is a Chemical Engineer with a PhD degree from the Université Laval, Québec, Canada and post-doctoral research at Kungliga Tekniska Högskolan, Stockholm, Sweden. He is now retired and a collaborating Professor at the Federal University, Uberlândia, Brazil with interests in urban geography, sanitation and sustainability. He has served as a Guest Editor for the *IJEWM*, is editorial board member of the *IJEE* and reviewer of 72 scientific journals. He has published extensively on urban waste management in emerging economies and appears in numerous biographical reference sources.

Recently, I was asked to define *garbage* to lay people. Lay people with respect to environmental management, that is. They were all professionals of some field. So what is *garbage*? It does not exist in nature or on the market. It is produced by families right in the residences. The emphasis is on *produced*! How so? If you have a banana or a potato peel, this is not *garbage*. It is a food residue that can be composted and returned to the cropland. If you have a used sheet of writing paper or some pieces of cardboard, this is not *garbage* either. It is a cellulose residue that can be collected and returned to the paper machine. No *garbage* so far. Now, as soon as the families decide to mix the two items and to put them into a single bag to be thrown away, they *produce garbage* because then neither residue can be used again. *Garbage* then is not a by product of manufactured goods or agricultural produce. It is a product of human behaviour.

Once *garbage* is produced, what does it consist of? There is a surprising similarity in comparable countries. Since I live in the BRIC community (acronym for the emerging economies Brazil, Russia, India and China), my data originate from a group of countries I like to refer to as BRIC et al. *Garbage*, or raw waste if you like, has been analysed in many of those countries. How much biodegradable matter has been found? China 72%, India 71%, Brazil 72%, Nigeria 72%, and Nepal 71%. How many plastics? China 11%, India 9%, Brazil 11%, Nigeria 11%, and Nepal 12%. In other words, comparable countries – comparable *garbage* – and consequently comparable needs for management. The world is not as vast and diversified as it may appear to the unsuspecting beholder! We are a global village after all. The apparent similarity may be misleading, though. Raw waste analysis is only the starting point of waste management. The ensuing competition poses to the cited countries the following challenge: Who will first succeed in transforming *garbage* composition into residue composition, or if you like, raw waste composition into sorted waste composition? What can be recycled is clean residue, not raw waste or *garbage*.

Good management practices drive the composition around in a circle with a velocity that depends on local talent. *Garbage* composition opens and closes that circle as it is progressively transformed into residue composition. The secret of management here is to induce people to stop *producing garbage* and instead provide clean residues for recycle. The success may be represented by sequential points on the circle. Take the biodegradable matter as example. In the *garbage* there were 72% of it, but there was zero residue because *garbage* by definition is mixed matter. As soon as a community sets out on its learning curve and starts to keep its different residues separate, the percentage of biodegradable residue begins to grow and the *garbage* begins to diminish. I have lately seen biodegradable residues reach 47% in medium size communities and 62% in small communities through sustained effort over long periods of time. Notice that I am speaking now about residues and no longer about *garbage*. Residue by definition is material that has never been mixed and therefore never became *garbage*.

The picture of the circle may be obvious now. As the effort proceeds, the biodegradable residue will eventually move around the circle and up to its limit of 72% of all waste and will thus be available for recycling. This closes the circle. Behaviour management will have transformed 72% of biodegradable *garbage* into 72% of clean biodegradable residue for recycling. All other components will follow comparable evolutions, and the tale of *garbage* composition will become the tale of residue composition. The nomenclature is still somewhat precarious, but the basic idea of the composition tale is alive and invites for the big competition: Who will first succeed and become the champion of BRIC et al.?