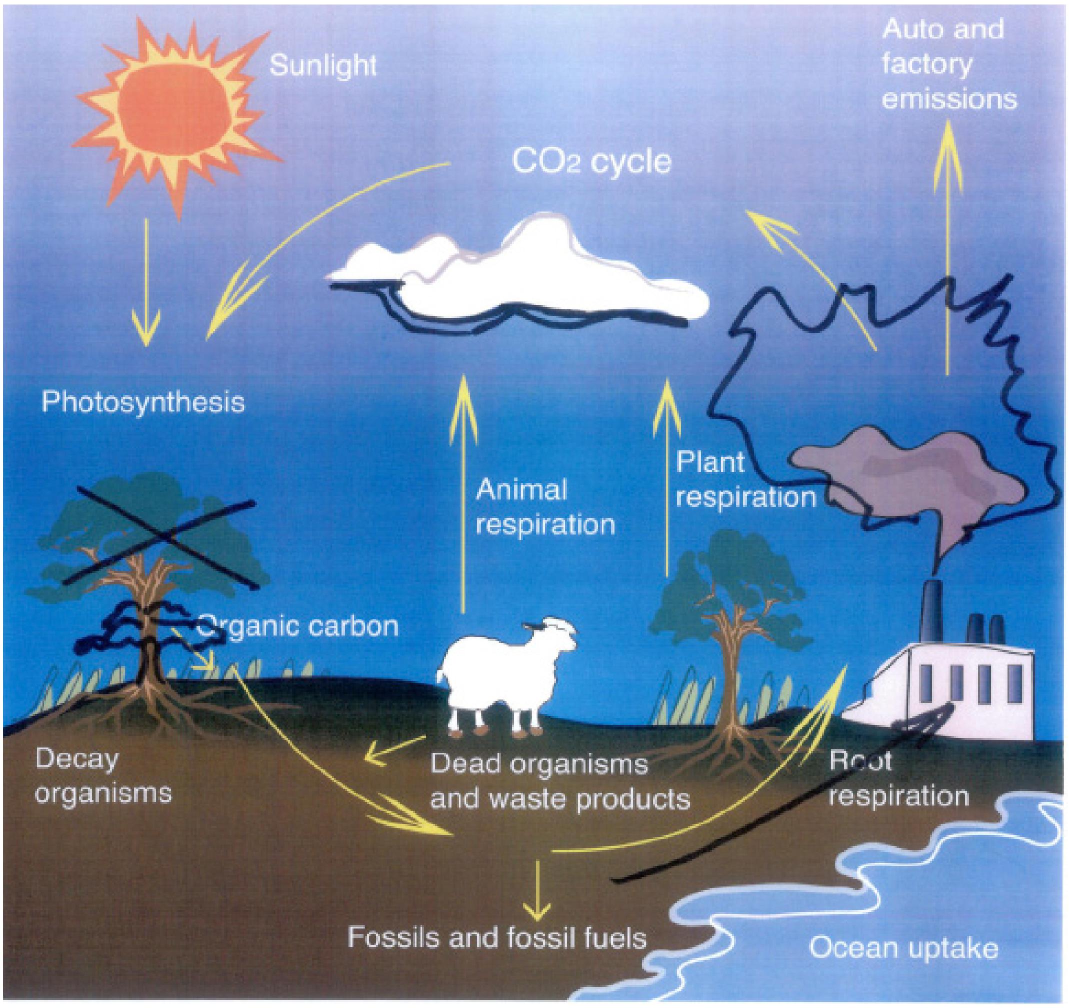
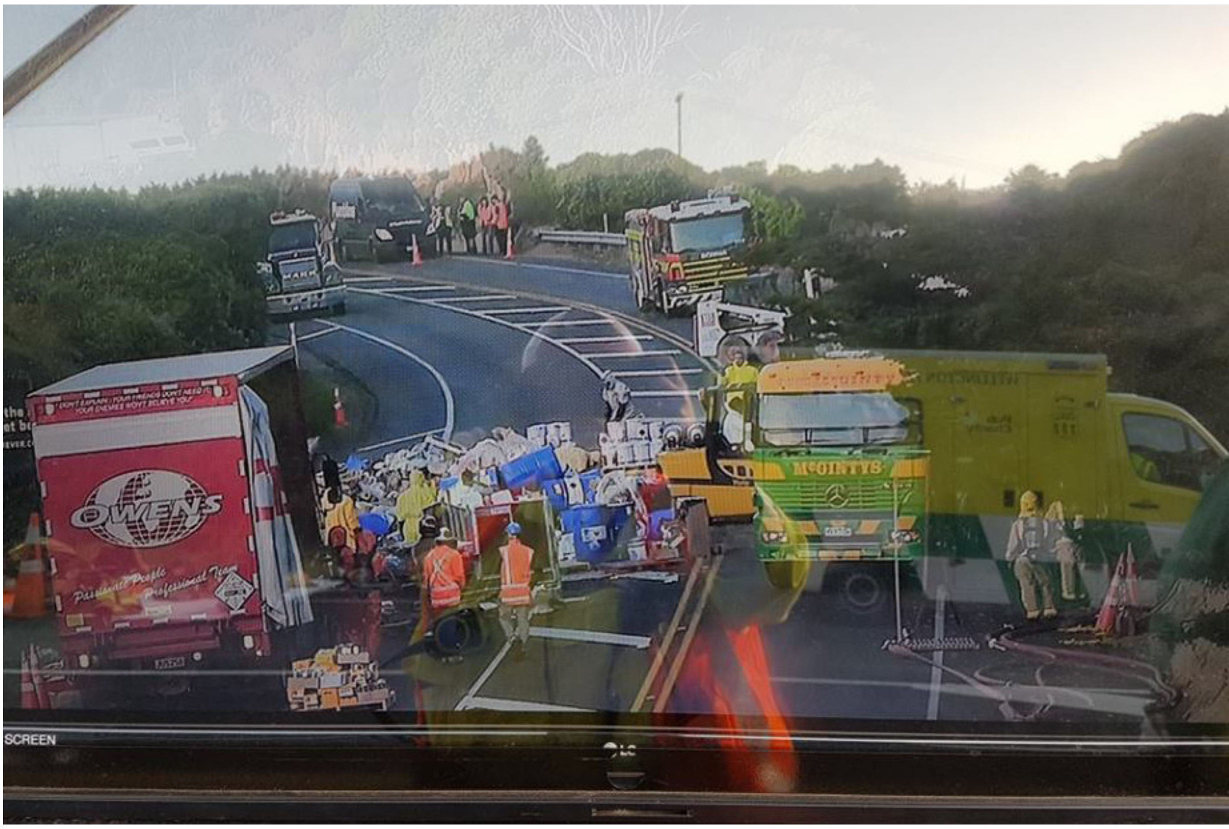
FLASHPOINT

Spring 2018



Humans modified carbon-cycle



Unexpected delivery!

NZ INSTITUTE OF
HAZARDOUS
SUBSTANCES
MANAGEMENT

USEFUL ORGANISATIONAL CONTACTS

NZ Institute of Hazardous Substances Management
(formerly the Dangerous Goods Inspectors Institute)
www.nzihsm.org.nz
The official home of professionals committed to the safe management of hazardous substances and dangerous goods. The NZIHSM is a 'not for profit' industry association whose goal is to protect people, communities, and the environment against the adverse effect of hazardous substances, while maintaining the benefit of these.

Responsible Care NZ
Box 5557 Wellington 6145
Responsible Care NZ works with industry partners to implement the Hazardous Substances legislation.

Worksafe (MBIE)
www.worksafe.govt.nz
Government agency formed to povide compliance advice and enforcement of hazardous substances. Responsible for hazardous substances certificates.

EPA
www.epa.govt.nz
The EPA administers the HSNO Act and supplies extensive information on working with hazardous substances.

Ministry for the Environment
www.mfe
The Ministry provides policy, publications, technical reports and consultation documents on HSNO legislation.

Department of Building and Housing
www.dbh.govt.nz
The Government agency that maintains the Building Act and the Building Code.

Local Government NZ
www.lgnz.co.nz/lg-sector/maps/
Local Authorities have responsibility for policing building controls. Some local authorities are contracted to Department of Labour to provide enforcement of hazardous substances legislation. Often a first response point with valuable local knowledge.

Government legislation
www.legislation.govt.nz

If you know of other agencies which could be useful to members, please let us know at office@nzihsm.org.nz.

President's column

Our party needs cooling, but it's not over yet!

We have come a long way in a relatively short time; we have conquered food and off-set those bugs and lifeforms that could tip us over. We have created technologies to harness our energy, no longer needing to till the turnips but can wave a credit card to deliver all our life needs to us.

Since we started our farming using genetic modification to further our food supply and mastering chemicals to combat disease, fly the planet and solve life's natural problems it has been like we are in a human party! Humans could conquer everything; we have mastered our planet and nature should follow our will.

Unfortunately Mother Earth has her own rules and one from her science seems to be that we cannot continually take without some giving, and we must understand and balance all processes to line up with nature.

This, unfortunately, includes our use of energy to cook our meals, preserve our food, power our habitats and speed us around our planet. Electricity may be the key but can we instantly increase from our current shortage of renewables with only 40% of our current energy from wind, geothermal and water? We are slowly realising the problems and this Flashpoint contains some solutions to these issues.

Some examples of our science providing solutions are in the articles:

(i) How the EPA is progressing its analysis of chemicals

(ii) How to balance our energy needs with those of our planet in "Is our energy party over?"

(iii) How a chemical transport accident closes a major road

(iv) What happens when the chemicals go wrong?

This all demonstrates that progress is continuing to happen, and as was discussed at a recent compliance certifier seminar, we are all seeking gradual improvement and alignment with Mother Nature as we all seek to enjoy our beautiful planet together.

John Hickey Institute president

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Flashpoint

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EPA ramping up reassessments programme

The Environmental Protection Authority is ramping up its reassessments programme and taking action on some chemicals to ensure risks to people and the environment continue to be managed effectively.

Working with international counterparts it has identified a priority chemicals list of around 40 chemicals that require review and scrutiny. This will involve reviewing the rules that apply to those chemicals to ensure risks to people and the environment continue to be managed effectively, providing greater confidence for New Zealanders that the EPA is properly managing their health and environmental concerns on their behalf and on behalf of future generations.

"This is an extensive and important programme of work that goes to the heart of keeping New Zealand and New Zealanders safe," said CEO Dr Allan Freeth. "It is designed to lay the foundations for a modern chemical management system; one supported by robust and up-to-date evidence and data, and which aligns with the standards, knowledge and practices recognised by our regulatory partners globally.

"Industry groups, importers, manufacturers and our trading partners will also enjoy greater consumer and international confidence in the way New Zealand manages its chemical regime. Our worldwide knowledge about chemicals and their effects increases every day through advances in science and technology. At times, new information may indicate a chemical poses more risks than existed, or that we knew of, at the time it was originally approved for use in New Zealand."

When an approval is granted for a chemical to be used in New Zealand, that approval does not expire. The only legal way it can be amended or revoked is when the EPA, or an interested party, takes formal action.

"The EPA did this in April 2017 when it reassessed five approvals for the pesticide chlorothalonil. At that time it revoked four of those approvals for domestic use and restricted a fifth approval to commercial use only."

As part of the programme, grounds for reassessment have already been established for the herbicide paraquat, and a call for information has been completed. Further grounds for other chemicals on the priority list are being prepared for consideration by an EPA decision-making committee in the near future. Reassessments can be complex, lengthy and some may cost more than $1 million. The EPA is funding this initial reassessment work by reprioritising its current expenditure, and is in discussion with the Government on longer-term funding.

Environmental Protection Authority
Te Mana Rauhī Taiao

150,000 substances covered

NZIHSM members will be aware that a large and diverse number of chemicals classed as hazardous substances are in use in New Zealand. There are around 9000 individual approvals and 210 Group Standards, which cover a total of some 150,000 substances.

A Group Standard can be used to approve ranges of similar substances routinely used in groups of commercial products (for example, toothpaste, cosmetics, some industrial raw materials etc). A significant number of approvals have been carried forward from regimes in place before the Hazardous Substances and New Organisms Act came into full effect.

Reassessment is the formal legal process for the EPA to evaluate any new information, and take action to prevent, manage, mitigate or reduce risks that may have come to light since an approval was first granted. The process is a two-step one.

The EPA assesses and approves hazardous substance applications (about 100 new applications/year) with appropriate input from WorkSafe New Zealand.

The Priority Chemicals list replaces the EPA's former Chief Executive-Initiated Reassessments list.

EPA's latest chemical priority list

Revised priority chemicals list as at 15 October 2018.

2,4-DB (sodium salt)

A herbicide mainly used to control broadleaf weeds in an agricultural setting. It has a similar structure to 2,4-D (also an agricultural herbicide). It is categorised in Priority Group B due to its very high score for human health risk and its moderately high score for environmental risk.

4,4'-(1-Methylethylidene) bis [2,6-dibromophenol] (TBBPA)

TBBPA is a brominated chemical widely used for its fire retardant properties. It is categorised in Priority Group B due to its very high score for human health risk, though its score for environmental risk was moderately low. Concerns over its persistence also contributed to its high score.

Alachlor

Alachlor is a herbicide used mainly used in crops. It is part of the chloroacetanilide family. It is categorised in Priority Group B due to its very high score for human health risk and high score for environmental risk. Concern about persistence also contributed to its high score.

Alpha-Cypermethrin

Alpha-cypermethrin is a synthetic pyrethroid insecticide with approvals for home use products, veterinary medicines, and agricultural products. It is a specific mixture of cypermethrin isomers. *See 'cypermethrin' entry also.* It is categorised in Priority Group A due to its very high scoring for both human health risk and environmental risk. Availability to home users was also a contributing factor to the score.

Amitrole

Amitrole is a non-selective herbicide used in agricultural settings, public areas, and in home garden products. It is a member of the triazole family. It is categorised in Priority Group B due to its very high score for human health risk though its score for environmental risk was moderately low. Its availability to home users also contributed to its high score.

Ammonium pentadecafluoro-octanoate (APFO)

Ammonium pentadecafluorooctanoate (APFO) is used in industrial settings, but is also found in some consumer products. It is the ammonium salt of perfluorooctanoic acid. It is categorised in Priority Group B due to its very high score for human health risk, though its score on environmental risk was low. Concerns regarding persistence and bioaccumulation also contributed to its high score.

Benzo[a]pyrene

Benzo[a]pyrene is mainly encountered in industrial settings but also has presence in some consumer products. It is categorised in Priority Group A due to its very high score for human health risk and high score for environmental risk. Concerns regarding its presence in the home, persistence and bioaccumulation also contributed to its high score.

Bifenthrin

Bifenthrin is a synthetic pyrethroid insecticide used in both domestic and agricultural settings. It is categorised in Priorty Group B due to its very high score for environmental risk score, though its score for human health risk is moderately low. Availability for home use and concerns over persistence were also contributing factors to its score.

Bioresmethrin

Bioresmethrin is a synthetic pyrethroid insecticide with approval for use in both domestic and agricultural settings. It is categorised in Priorty Group A due to its very high score on both human health risk and environmental risk. Approvals for home use was also a contributing factor.

Brodifacoum

Brodifacoum is a vertebrate toxic agent used to target mainly rodents and possums. It used in both domestic and commercial settings. It is categorised in Priority Group B on the basis of its high scoring both for human health risk and environmental risk. Availability for home use and concern over persistence were contributing factors.

Bromadiolone
Bromadiolone is a vertebrate toxic agent used for targeting rodents. It used in both domestic and commercial settings. It is categorised in Priority Group B due to its very high scoring for human health risk, though its score for environmental risk was moderately low. Availability for home use and concern over bioaccumulation were contributing factors.

Carbaryl
Carbaryl is an insecticide. It currently has approvals for use in horticultural settings and in home use veterinary medicine products. It is categorised in Priority Group A due to its very high scoring for both human health risk and environmental risk. Concerns about its degradation pathway in the environment and its availability to domestic users also contributed to the score.

Carbendazim
Carbendazim is a fungicide used for control of fungal diseases in various crops. It also has potential for use on turf in public areas and as a timber treatment. It is categorised in Priority Group B due to its very high score for human health risk, though its score for environmental risk was moderately low. Concerns regarding its persistence also contributed to the score.

Chloropicrin
Chloropicrin is a chlorinated compound used in agricultural settings as a soil fumigant. It is used by licensed professionals to control a range of soil-borne pests. It is categorised in Priority Group B due to its high scoring for both human health risk and environmental risk.

Chlorpyrifos
Chlorpyrifos is an organophosphate insecticide currently approved for commercial use in crops, as a veterinary medicine and as a timber treatment chemical. It is categorised in Priority group B due to its very high score for environmental risk and moderately high score for human health risk. Concerns about its persistence and potential use in public areas also contributed to the score.

Cyfluthrin
Cyfluthrin is a synthetic pyrethroid insecticide with approvals for use in both domestic and commercial settings. It is categorised in Priority group B due to its very high score for environmental risk and moderately high score for human health

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Cyhalothrin
Cyhalothrin is a synthetic pyrethroid insecticide with approvals for commercial use. See 'lambda-cyhalothrin' entry for the more commonly used mixture of isomers. It is categorised in Priority Group B due to its very high score for environmental risk and moderately high score for human health risk. Concerns about its persistence also contributed to the score.

Cypermethrin
Cypermethrin is a synthetic pyrethroid insecticide with approvals for home use products, veterinary medicines, and agricultural products. See the 'alpha-cypermethrin' entry also. It is categorised in Priority Group A due to its very high scoring for both human health risk and environmental risk. Availability to home users is a contributing factor to the score.

Cyproconazole
Cyproconazole is a fungicide used on various crops, turf and as a wood preservative. It is categorised in Priority Group B due to its very high score for human health risk, though its score for environmental risk is moderately low. Potential for use in public areas also contributed to its score.

Deltamethrin
Deltamethrin is a synthetic pyrethroid insecticide with approvals for home use products, veterinary medicines, and agricultural products. It is categorised in Priority Group B due to its very high score for environmental risk and high score for human health risk. Availability to home users was also a contributing factor to the score.

Diazinon
Diazinon is an organophosphate compound used as an insecticide. It currently has time-limited approvals for agricultural and home garden use. It is categorised in Priority Group B due to its very high score for human health risk and high score for environmental risk.

Dichlobenil
Dichlobenil is a herbicide used for controlling various weeds. It can be used on certain crops and in more general purpose weed control. It is categorised

in Priority Group B due to its very high score for human health risk and high score for environmental risk. Potential exposure in public areas also contributed to the score.

Dichlorvos
Dichlorvos is an organophosphate compound used as an insecticide. It has current approvals for use in various crops and as part of biosecurity insect control. It is categorised in Priority Group B due to its high score for both human health risk and environmental risk.

Diuron
Diuron is a herbicide and algicide. It has current approvals for use on crops and for water treatment chemicals. It is categorised in Priority Group B due to its very high score for human health risk and high score for environmental risk. Concerns about its persistence also contributed to its score.

Fenitrothion
Fenitrothion is an organophosphate compound used as an insecticide. It currently has approvals for insect control uses, although use on crops and pasture is prohibited. It is categorised in Priority Group A due to its very high score for human health risk and environmental risk.

Fenthion
Fenthion is an organophosphate compound used to treat domestic animals for fleas. It is categorised in Priority Group B due to its very high score for human health risk and its moderately high score for environmental risk.

Flocoumafen
Flocoumafen is a vertebrate toxic agent used for targeting rodents. It is used in both domestic and commercial settings. It is categorised in Priority Group B due to its very high score for human health risk and its high score for environmental risk. Availability for home use and concerns about bioaccumulation also contributed to its score.

Flumioxazin
Flumioxazin is a herbicide used for weed control. It currently has approval for use in agricultural settings. It is categorised in Priority Group B due to its high score for both human health risk and environmental risk.

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Folpet
Folpet is a fungicide for use on certain crops. It is categorised in Priority Group B due to its high score for both human health risk and environmental risk. Availability for home use contributed.

Lambda-cyhalothrin
Lambda-cyhalothrin is a synthetic pyrethroid insecticide. It has approvals for both agricultural and domestic uses. It is categorised in Priority Group A due to its very high score for both human health risk and environmental risk.

Maldison
Maldison (also known as Malathion) is an organophosphate compound used as an insecticide. It is currently used in agricultural settings. It is categorised in Priority Group B due to its high score for both human health risk and environmental risk.

Oxadiazon
Oxadiazon is a herbicide used to control weeds in agricultural settings. It also used in home garden products. It is categorised in Priority Group B due to its very high score for both human health risk and environmental risk. Availability for home use also contributed.

Paraquat
Paraquat is a herbicide used mainly in agricultural settings. It is categorised in Priority Group B due to its high score for both human health risk and environmental risk.

Permethrin
Permethrin is a synthetic pyrethroid insecticide. It has approvals for use in agriculture, veterinary medicines, timber treatments and home use products. It is categorised in Priority Group B due to its high score for environmental risk and its moderately high score for human health risk. Availability for home use also contributed.

Pirimiphos methyl
Pirimiphos-methyl is an organophosphate insecticide. It is used in on certain crops and in grain storage. It is categorised in Priority Group B due to its high score for both human health risk and environmental risk.

Propargite
Propargite is a pesticide used for controlling mites. It is used mainly in horticultural settings. It is categorised in Priority Group B due to its very high score for human

health risk, though its score for environmental risk is moderately low.

Propoxur

Propoxur is an insecticide that is part of the carbamate family.

It currently has approvals for home use insect control products, veterinary medicines and agricultural products. It is categorised in Priority Group B due to its very high score for human health risk, though its score for environmental risk is moderately low.

Tributyltin oxide

Tributyltin oxide is a tin-containing organic compound. It is mainly used as a timber treatment. It is categorised in Priority Group B due to its very high score for human health risk and its high score for environmental risk. Concerns over persistence and potential for bioaccumulation also contributed.

Trifluralin

Trifluralin is a fluorine-containing herbicide. It is currently used in agricultural settings. It is categorised in Priority Group B due to its very high score for human health risk and its high score for environmental risk. Concerns over persistence and potential for bioaccumulation also contributed.

Chemical spill shuts down holiday highway

First responders arriving on the scene of a truck crash at Pukerua Bay could have been forgiven a few pithy epithets… not only did they have a HSNO scenario, they had a chemical courier truck overturned with its cargo strewn across SH1, about six hours before the beginnings of the Labour Weekend holiday traffic flow began to build up.

If it is a petrol tanker, it is a 'straight-forward' job of containment and clean-up. But a large chemical courier truck has hundreds of individual consignments that could range from acids of one variety or another through solvents and all sorts of generally corrosive compounds that are very useful in their place. However, their place is not spread across a state highway.

It was about 4am, the time when truckies are looking forward to the last half hour or so of driving before rolling into Wellington and the end of shift. For the earliest caught in the accident, it would be 17 hours before they rolled on again.

The spill scene rapidly escalated into attendance by seven trucks and 50 firefighters and specialist staff. Most of the consignments proved to be paint products, but they all had to be checked out and preventative measures taken so nothing entered nearby sensitive wetlands.

The accident really exposed the vulnerability of access to the capital. Cars and smaller trucks were diverted around the hilly and twisting Paekakariki Hill Road and the inevitable happened … that road was also closed for a while after two trucks met head-on.

So while truckies sweltered under the Sun and prayed for Transmission Gully to be finished any day soon, the restoration of the state highway continued. About 400 mainly long-haul trucks were caught up in a tail-back of several km.

Civil Defence Minister Kris Faafoi said, given the volume of chemicals involved, the emergency services deserve praise as it wasn't just a case of picking up low-risk cargo off the road.

Cleared chemical containers being loaded for trans-shipment from the Pukerua crash site (via the command unit's camera). Photo: *Porirua VFB*

Foam won't go away

The firefighting foam story just will not go away and big hitters have got involved.

Celebrity lawyer Erin Brockovich has been in Australia, talking about the contamination crisis as a result of firefighting foam containing toxic chemicals. At the other end of the scale, ordinary citizen American insurance underwriter Michael Hickey has been at the forefront.

His father died of kidney cancer, in Hoosick Falls, upstate New York in 2013. A session on Google, led to water tests at a local McDonald's, and eventually to the drastic lowering of safe health thresholds for foam across the US.

His father drove the school bus during the day and worked in a plastics factory at night, making Teflon products. PFOA is one of two key damaging chemicals, along with PFOS, that was common in firefighting foam, Teflon and Gore-Tex, till manufacturers began getting sued. They found alternatives, but they often contain related compounds over which there are also are many question marks.

The PFOA and PFOS are at the centre of a controversy over groundwater and soil contamination at Defence Force bases and airports around New Zealand. They have also been used in the past by the NZFS.

Hoosick Falls authorities did not want to investigate. So he did it himself. A Canadian lab the sent him a cooler, eight jars, and t asked for four different samples. "Our local government wouldn't give me the raw samples so I went to private wells that I knew weren't on our municipal water supply, which was at our local McDonald's and a local variety store. I took one from my house, I took one from my mother's house.

"All of them came back positive. But the ones that came back the highest were actually the ones on the municipal water supply, which were my house and my mother's house ... then I knew I was right."

It took a year, and approaches to village, county, then state governments, before the Environmental Protection Agency stepped in and stopped locals drinking the water. Eventually, half the 7000 people in the surrounding area got blood tested for PFOA.

The resulting anger over high levels, including in young children, pressured the EPA to drop the federal safety guideline for PFOA in drinking water from 400 parts per trillion to 70 parts.

In New Zealand, the guideline level remains at 560, eight times higher. Because it is an interim guideline only, health authorities in this country do not need to be notified if PFOS or PFOA are found in water or soil.

Another three years on in Hoosick Falls, and the village has a $10 million carbon filter system and zero PFOA in its water, though the fight is continuing to get clean water piped in from miles away, rather than rely forever on the treatment system.

We haven't heard the last of this. In due course judgments will be made on NZ sites, local bodies will need to do remediation and then the compensation battles will no doubt begin.

Is our energy party over?

We all love this planet, it is OUR planet, a thing of beauty, blues and greens! Other species have occupied our planet before us, then vanished in the mists of time, but can we humans escape this fate?

Great wisdom or great folly?
In April 2018 the New Zealand Government announced it was suspending future 'oil and gas' exploration permits. But oil is our society's treasure, the basis of our recent civilisation – it provides most of our food, heat, transport, energy, chemicals and life. Is this great wisdom or folly?

Our Earth has been in existence 4.5 billion years and general consensus is that life started with plankton, and following from these, our ancestors 'the upright ape' have been around these parts for some 2-2.3 million years.

Some believe that we 'rule the Earth' as a right of our 'ability to think', and following these thoughts the homo-sapien species came out of Africa some 200,000 years ago in search of food and sustenance.

To brighten the food some 135,000 years ago, we found fire (and the ability to cook the dinner) spreading across the planet through to America some 70,000 years ago, Australia 50,000 years ago and recently resting in New Zealand only 1500 years ago.

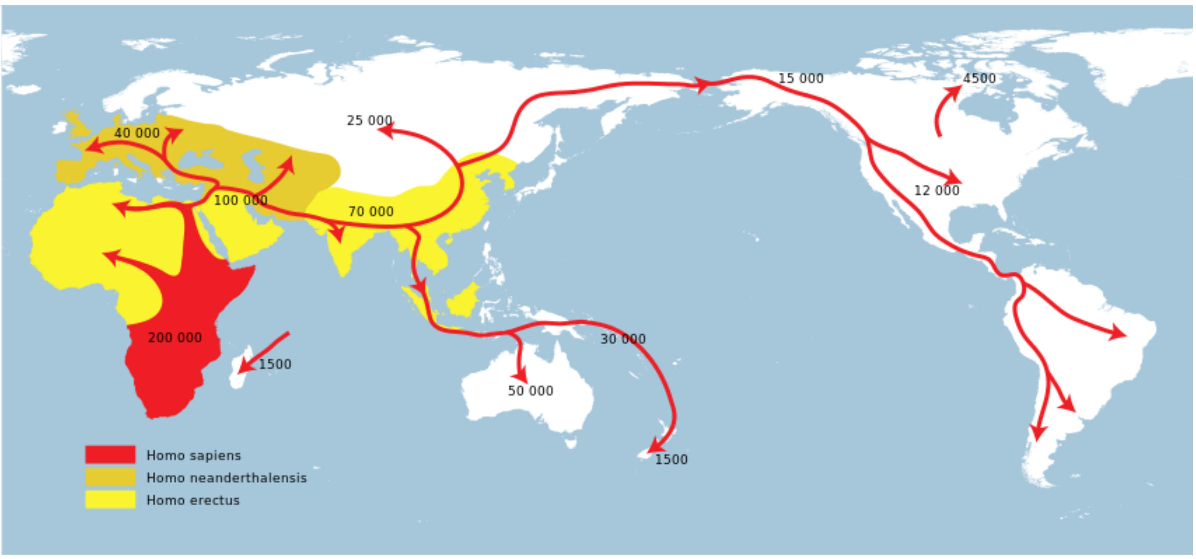
Yes we are 'clever monkeys' and we found that not only by using wood from trees, but in the last 1000 years by digging up the oil from plankton or buried plants as coal we were really able to get the heat, fuel and plastics to really get the party going!

But these are 'big time 'numbers

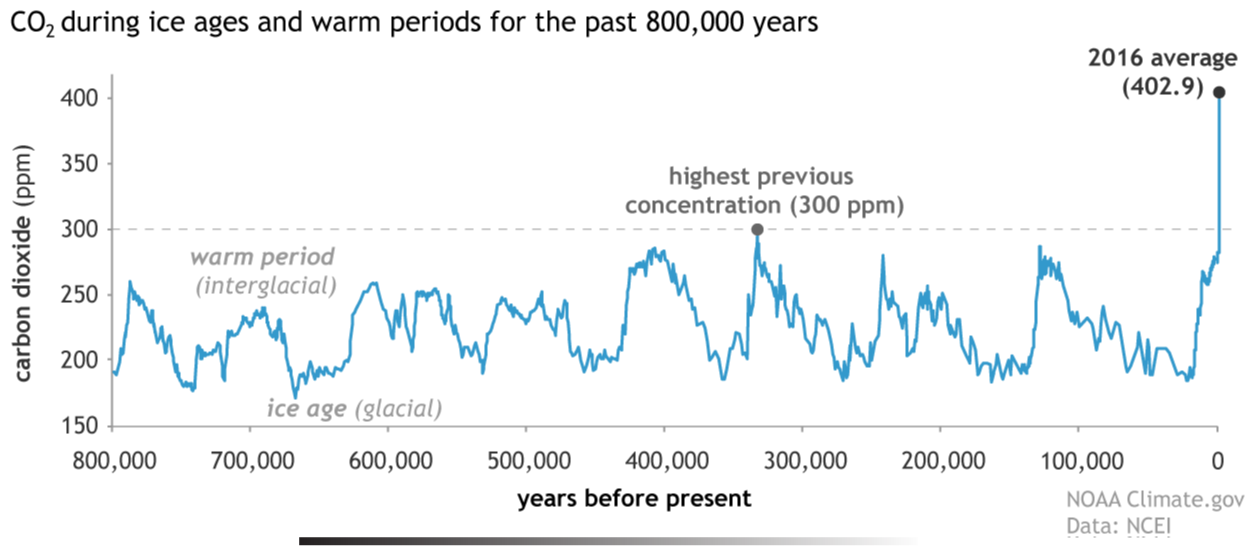
History of Energy on Earth

Item	*Actual Years ago*	*Proportion of 24 hour basis (%)*	*Proportion of 24 hour basis (sec)*
Existence of Planet Earth	4500000000	100.0000000	86400.0000
Homo-sapien existence	2300000	0.0051111	4.4160
Homo-sapien spread out from Africa	200000	0.0004444	0.3840
Humans find Fire and Wood	135000	0.0003000	0.2592
Humans arrive in Americas	70000	0.0001556	0.1344
Humans arrive in New Zealand	1500	0.0000033	0.0029
Humans find Coal, Oil & Gas	300	0.0000007	0.0006

(i) Elapsed time has been converted to a 1 day (24 hr) basis to show relative age



Spread of humanoids around the world.



indeed and as such almost incomprehensible. If we turn our planet's history into a recognisable 24 hour basis, as shown in the attached table, our 'upright sapien species' have been around for around 4.3 seconds and our latest oil-based flare-up around one thousandth of 1 second (0.001 sec).

By using this buried treasure we have had a temendous party indeed, we have fire and food, moving from hunter-gatherer to farming food with one farmer now able to feed thousands! With this easily available food we have been able to grow our species, making time for education (and thinking), finding new and wonderful products and ways of keeping this party going.

We were able to create bronze, steel, concrete and electricity so that we could live together in villages then tall-tower cities and for those who were sick of this, we learnt to get off our 'hind legs' with new transport. Then in very recent years we found the wonders of oil-based plastics, oil-based refrigeration to keep our food fresh for longer, and trained, driven and flown around our planet and even out towards the stars as we stretched into the space before us.

What a celebration, with our 'control of chemistry' slowing the 'bugs', and the fun of new foods and plastics as we have worked out new ways to manage our planet to suit us.

Many of us have lived like the kings of old by harnessing this food, gadgets and power of communication in such a way that by waving a piece of plastic at a supermarket our food can appear before us without a spade in sight. Even our dreams can be instantly delivered across our planet down a simple metal wire.

These buried treasures have delivered a wonderful time for many of us, at the flick of a switch, without a worry in the world!

However, some evidence of our recent celebration is shown in the variation in the rate of CO2 in our Earth's atmosphere over the last 800,000 years (see above). For the first 790,000 years the CO2 has gone up and down in a form of cycle, to cope with volcanoes erupting, meteors in a similar manner to many 'balanced processes" as they cope with outside impacts.

But if we look at the recent CO2 concentration line, over the past 300 years this has risen straight –up almost asymptotically, outstripping the previous cycles as it rises towards an unknown future. This is interesting as it demonstrates that some-how our homo-sapien species is influencing our planet in ways that no earth-dominant species has influenced this before.

But wait, our earth may be rebelling, with superheated storms and summers becoming norms, our birthplace Africa is in drought and the bugs are coming back!

A plaintiff cry is dawning "OUR Party may be great, but WHO is doing the Dishes?"

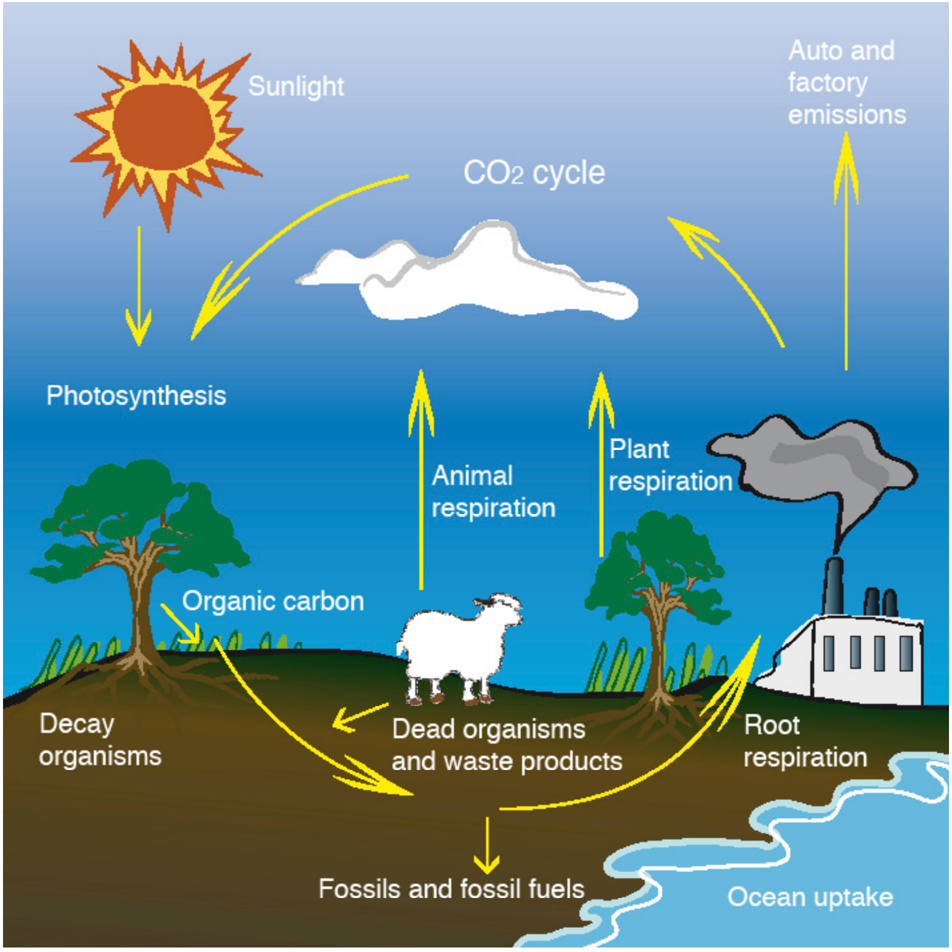
So what's the fuss, we have always coped before, and why should we slow down our Party to placate an irate planet and why does a bit more carbon in the atmosphere matter??

Well as is usually the case with a science-based process, it often cannot absorb a foreign-impact forever, and inevitability the result of "any action is an opposite reaction" as a system balances itself against the impacts from outside.

What is the impact of just a little extra CO2?

One result is the greenhouse effect, where like the glass in a greenhouse, our local sun's shorter 'ultraviolet rays' can pass through the CO_2 cloud to be absorbed in the earth, but the resultant longer and heating 'infra red' rays given off as the planet absorbs the ultraviolet rays are trapped under the CO2 cloud, further heating up the planet.

This additional heat provides more energy for storms, drying the water off marginal land masses while melting remaining icecaps to raise sea-levels and saltwater to low lying island areas.



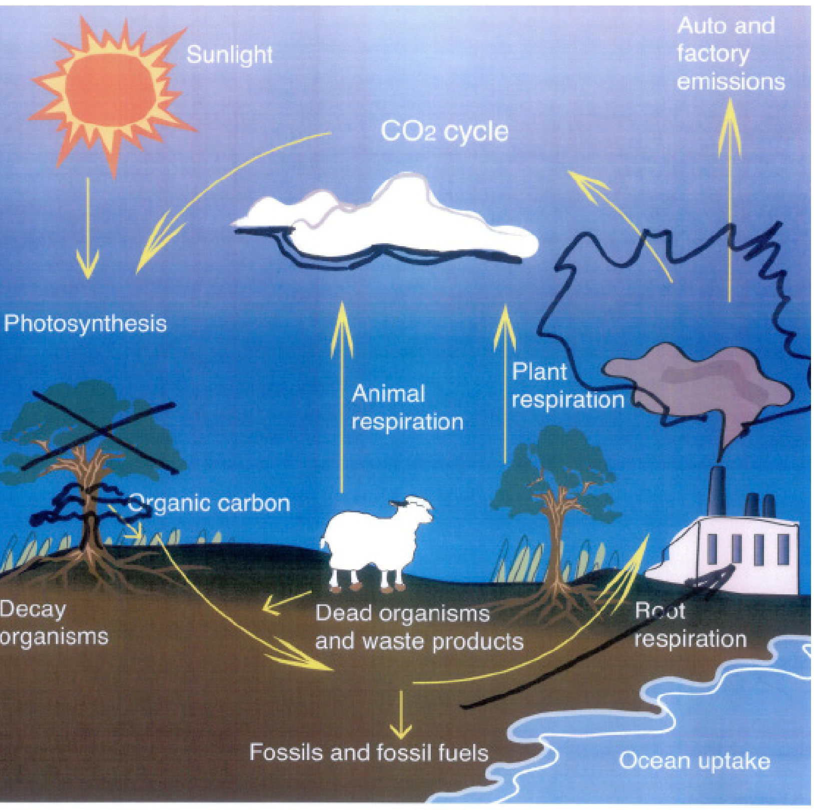
What is this process and what can we do about it?

Earth life is a breathing mixture of carbon, air and water. In an ideal Earth process its carbon –cycle is balanced, animals and plants live dependently with each other – animals living by breathing in oxygen and expelling CO2 while the plant-life absorbs the 'carbon-dioxide' during their photosynthesis process and renewing the oxygen.

In theory a wonderful system, as is shown on the attached "Carbon cycle' diagram where balance is achieved and the process lasts forever.

In recent times, however, human's modified carbon cycle has somewhat stilted earth's natural Carbon cycle as we have found the hidden treasures of Coal, Oil and Gas and used them for food, power, transport, housing, plastics, education and organic-chemicals and all of those wonderful things that our 'Oil age" has delivered.

The problem is that we have dug up and used these carbon treasures but not replaced them into the earth, rather dropping them in non-absorbent forms into the seas and what is more we have cut down many carbon-absorbing trees somewhat reducing the earth's ability to cope as is shown in the Human modified Carbon Cycle diagram (below). In effect we have skewed the Carbon-Cycle and reduced its natural ability to cope,



HUMANS MODIFIED CARBON-CYCLE

with one catastrophic possible outcome being the curtailing of life or the Party as we know it. Our absorbing trees have become smaller and contributing fuel trees bigger with larger clouds between.

So what DO We DO about it?

To put it simply we need to again 'balance the process' we need the carbon in to equal the carbon out. And to adopt our search and rescue terminology we too need to adopt a SAR approach as outlined in The carbon re-cycle diagram.

Sequester (search and sequester, bury or scrub) excess

Absorption (find and bind or absorb excess carbon with planting trees the simplest)

Recycle (recycle the treasures that have been dub up from beneath us so that we can re-use the benefits multiple times without further polluting the earth around).

None of this will unfortunately be easy and we will need to abandon our throw-away culture and find new ways to reuse or recycle the carbon riches that we have so recently obtained.

Can we do it?

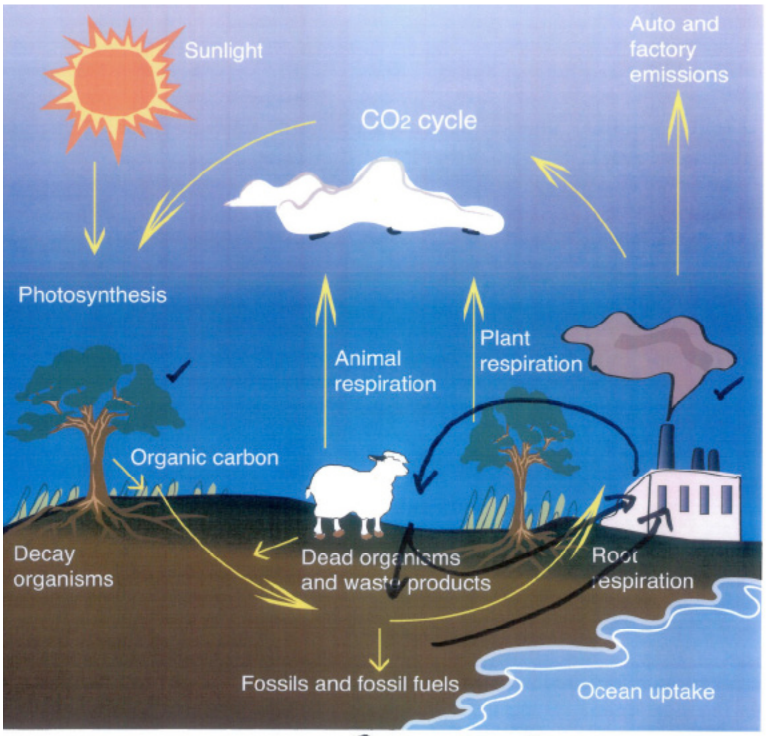
Well if we do not, the Party may indeed be shortened and life as we know it will need to make great changes as we adapt to a far more turbulent planet than recent-past human have been used to, and in the worst case over time we may follow the demise of those dominant life species before us.

We do need to 'balance our celebration' although it would be nice if we could develop our saving technologies rather than just cancel our Party!

So if we can find ways to reuse and/or recycle those treasures that we have already got at out disposal then our NZ Government's brave, albeit risky strategy may indeed prove correct! Is this decision to ban oil and gas exploration which accounts for ovr 40% Great Wisdom or Great Folly?

It is too early to tell as if we cancel oil and gas we rapidly need to develop alternate and sustainable energy technologies (as shown in the attached table), but then in our 'brief human history' to date, it is a brave decision and there is a very human phrase, "Fortune favours the Brave".

John Hickey
Chemical engineer/Certifier



THE CARBON RE-CYCLE

Actual Energy Use in New Zealand 2017

Gross petajoules (PJ) *Primary Energy Supply*	2017	% total	2017 *Renewable*	2017 *Non-Renewable*
Coal	*51.39*	5.5%		51.39
Oil	312.52	33.5%		312.52
Gas	197.61	21.2%		197.61
Hydro	90.66	9.7%	90.66	
Geothermal	204.48	21.9%	204.48	
Other Renewables	73.92	7.9%	73.92	
Electricity			*see above*	
Waste Heat	1.19	0.1%	1.19	
Totals	**931.77**	**100.0%**	**370.25**	**561.52**
Indigenous Production	712.05	76.4%		
Imports	368.47	39.5%		
Exports	108.66	11.7%		
Stock Change	-26.05	-2.8%		
International Transport	66.14	7.1%		
	931.77	**100.0%**		
Total Percentages	**100%**		**40%**	**60%**

Source: MBIE Energy in New Zealand Report 2018

Chemical compliance system under review

EPA's chemical management compliance system designed to protect New Zealand and New Zealanders from environmental risks and disasters, is being independently evaluated to improve its effectiveness.

The compliance system needs refining to ensure risky environmental practices and systems can be managed effectively and promptly, says EPA's Dr Allan Freeth.

"Serious environmental incidents involving chemicals and other hazardous substances are fortunately rare. But when they seem imminent or do occur, compliance and enforcement action under any hazardous substances regulations needs to be swift and sure. Currently that is not the case."

EPA is funding a three-person, technical working group to recommend changes to the hazardous substances compliance and enforcement system.

"In one recent case (pictured below), a regulator became locked in lengthy action, exhausting all compliance options available to it under the Act. To take control of the affected site and reduce the risk to people and the environment, three emergencies were declared.

"Around 85 central and local government agencies, committed to protecting the health and safety of our people and our unique environment, have a role in managing hazardous substance compliance and enforcement," he said.

"While we know some agencies are well equipped with dedicated compliance teams, we also need to understand what can be done to assist others, where funding and resources can be an issue. Agencies must be supported and able to work with confidence when issues arise. This work is about developing a world-class chemical management system."

EPA estimates the review will cost $600,000–$800,000 and will come from the authority's baseline funding. It will be conducted by Lisa Te HeuHeu (Chair), Peter Harris, and Lindsay McKenzie. Lisa is the present Tumuaki of the EPA's Maori advisory board Nga Kaihautu.

Environmental Protection Authority
Te Mana Rauhī Taiao

Suicidal practice proves theory wrong

Half the silo that exploded was underground, producing a huge crater, but absorbing much of the potential blast wave. Photo: *Getty.*

As if Germany hadn't suffered enough in the First World War, suicidal practices at a chemical plant in 1921 caused devastation and loss of life on an unimaginable scale.

The plant at Oppau began producing ammonium sulfate in 1911, but during World War I when Germany was unable to obtain the necessary sulphur, it began to produce ammonium nitrate as well. Ammonia could be produced without overseas resources, using the Haber process.

Compared to ammonium sulphate, ammonium nitrate is strongly hygroscopic, so the mixture of ammonium sulphate and nitrate clogged together under the pressure of its own weight, turning it into a plaster-like substance in the 20 m high storage silos. Pick axes were needed to use to get it out, a problematic situation because they could not enter the silo and risk being buried in collapsing fertiliser. To ease their work, small charges of dynamite were used to loosen the mixture (it seems the workers and supervisors hadn't had the slightest science education! – Ed.)

Common practice

This apparently suicidal procedure was common practice. While well known that ammonium nitrate is explosive having been extensively used as such during the war, tests conducted in 1919 seemed to indicate that mixtures of ammonium sulphate and nitrate containing less than 60% nitrate were unlikely to explode. Today, that word 'unlikely' would bring a welter of regulations crashing down on the industry's head

Based on that, the material handled by the plant, nominally a 50/50 mixture, was considered stable enough to be stored in 50,000-tonne lots – more than 10 times the amount involved in the disaster. Nothing extraordinary happened during an estimated 20,000 firings, until the fateful explosion on September 21.

Real cause

The real cause of the accident died along with all the workers, however it has since been proved that the 'less than 60% nitrate = safe' criterion is inaccurate; in mixtures containing 50% nitrate, any explosion of the mixture is confined to a small volume around the initiating charge, but increasing the proportion of nitrate to 55–60% significantly enhances the explosive properties and creates a mixture where detonation is sufficiently powerful to initiate detonation in a surrounding mixture of a lower nitrate concentration which would normally be considered minimally explosive. Changes in humidity and density also significantly affect the explosive properties.

A few months before the incident, the manufacturing process changed, resulting in lowering the humidity level of the mixture from 3-4% to 2%, and also lowering the apparent density. Both these factors rendered it more likely to explode.

There is also evidence that the lot of mixture in question was not of uniform composition and may have contained pockets of up to several dozen tonnes of mixture enriched in ammonium nitrate.

Explanation

The explanation proposed is that one of the charges was by chance placed in such a pocket, which exploded with sufficient violence to set off some of the surrounding lower-nitrate mixture.

Two months earlier, at Kriewald, then part of Germany, 19 people had died when 30 tonnes of ammonium nitrate was detonated by people doing the same thing – a warning not heeded.

Two explosions, half a second apart, occurred at 7:32 am on September 21, 1921 at silo 110 of the plant, forming a crater 90 m by 125 m wide and 19 m deep. The explosions were heard as two loud bangs in north-eastern France and in Munich, more than 300 km away, and are estimated to have contained an energy of 1–2 kilotonnes TNT equivalent.

The value of damage was hard to estimate due to the post-war hyper-inflation of the local currency, but about 80% of all buildings in Oppau were destroyed, leaving 6500 homeless. The pressure wave caused great damage in Mannheim, located just across the Rhine, ripped roofs off up to 25 km away and destroyed windows farther away, including all the medieval stained-glass windows of Worms cathedral, 15 km to the north.

According to some descriptions, only 10% of the 4500 tonnes of fertiliser stored in the silo detonated in the incident.

80% of local housing was destroyed and 6500 people made homeless.

In Heidelberg (30 km from Oppau), traffic was stopped by the mass of broken glass on the streets, a tram was derailed and even there, some roofs were ripped off.

Five hundred bodies were recovered within the first 48 hours, with the final death toll recorded being in excess of 560 people. The funeral was attended by German President Friedrich Ebert and Prime Minister Hugo Lerchenfeld, and saw crowds of 70,000 people at the cemetery in Ludwigshafen.

About half the silo was set into the ground and no doubt absorbed a reasonable amount of the exlposive force – one shudders to think what the loss would have been if it had been sitting on the surface!

There are several YouTube reels of film from agencies such as Pathe News, on the incident.

Lack of worker protection global health crisis

Better protection of workers from hazardous substances are enshrined in 15 principles proposed by special rapporteur on human rights and toxics, Baskut Tuncak, who says exposure to hazardous chemicals is a global health crisis.

His report to the 39th session of the UN's Human Rights Council, argues that many companies and national governments are not meeting their duty to uphold the rights of workers under the Universal Declaration of Human Rights and the International Covenant on Economic, Social and Cultural Rights. These stipulate the right to safe and healthy working conditions. The ILO estimates that one worker dies every 30 seconds from exposure to toxic chemicals, pesticides, radiation and other hazardous substances. Mr Tuncak said this lack of worker protection must be seen as exploitation and possibly, modern slavery.

Plasticide the latest environmental atrocity

The latest atrocity being inflicted on the planet is plasticide.

There have been an increasing number of warnings of the impending doom surrounding plastic. Plastic represents a seemingly intractable environmental issue globally leading to coining of the word plasticide. The high visibility of plastic waste, combined with of a build-up of illegally dumped and land-filled waste is driving strong consumer awareness of and support for addressing the issues surrounding the use of plastic.

It is the latest political football in the environmental field. The problem is already so huge, it is in some sense irreversible, but the public is beginning to demand at least a halt to worsening of the problem. Suddenly the banning of single-use bag (the ubiquitous supermarkket bag, as an a example) is pre-eminent.

The main plastics by type are PET, HDPE, PVC, LDPE, PP, and PS. They are an everyday part of us: bottles, food trays, cling wrap, plastic bags, ice cream tubs, chip bags, drinking cups and cutlery. Other less visible but equally significant usage of plastics and hence waste generation, is found in the agricultural (eg bale wrap), transport (eg shrink wrap), automotive, construction materials, and electrical goods sectors.

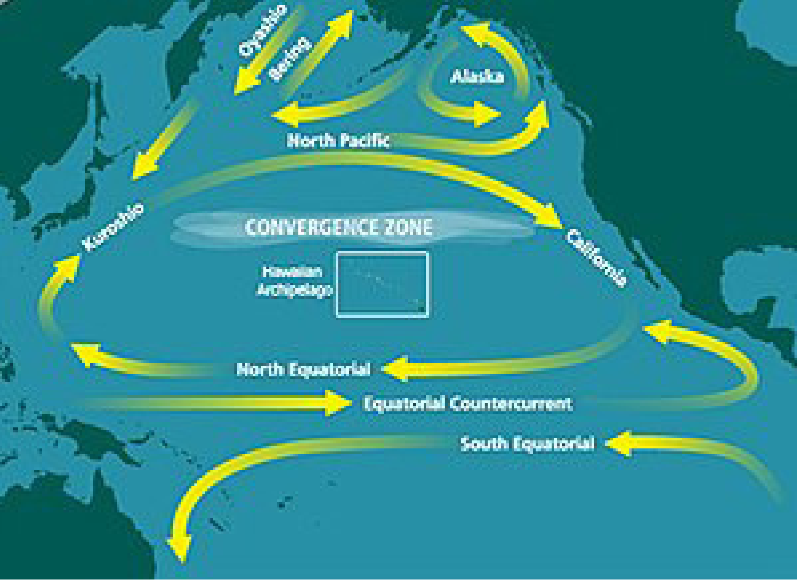
Globally the growth in production of plastic in recent years has outstripped global GDP growth. More oil now is used in the production of plastics than that used in the aviation industry. Only about one quarter of global plastic waste production is recycled or incinerated to produce energy; the other three quarters accumulates in landfills or the natural environment. One frightening estimate is that by 2050 there could be three times as much plastic in the oceans than fish by weight!

A fundamental problem is that plastics are designed to be indestructible, but are more often than not used only once. Few commonly used plastics are biodegradable so they accumulate in the environment rather than decompose.

Initiatives to move plastic from a use and dispose scenario, to one promoting re-use and recycle have been stalled for many years, as it has been cheaper to export plastic wastes to China than to transport the wastes to local processing facilities. Until recently China imported about 50% of all global plastic waste intended for recycle or destruction; however recent waste restrictions in China are now forcing all countries to look for other solutions.

As packaging accounts for around 40% of global plastic

The Pacific plastic garbage aft has been gathering for years, and now the Caribbean Sea is forming its own (pictured).



Pacific currents create a convegence zone like a whirlpool s sucking all the floating rubbish together.

use, bans are being demanded (and being put in place) on single-use bans on the most common, but easily replaceable single-use plastic packaging (eg polyethylene supermarket shopping bags), forcing a transition towards alternative products. There are now more drives towards recycling and recyclability.

While tax incentives to recycle and tariffs on imported plastic finished goods can promote recycling and promote alternative products, a reliance on the vagaries of government incentives is not a sustainable model on which to build a commercially viable recycling business.

The only way to permanently eliminate plastic waste is by thermal destruction; but incineration and energy recovery result in the release of carbon dioxide. Hence contamination of the environment with plastic waste seems to be a near-permanent outcome. Plastics can be re-worked either mechanically by grinding, washing, separating, drying, re-granulating and compounding; or by using chemicals to degrade the plastic wastes into their basic chemicals for reuse in plastics or other manufactured products.

Recycling challenges

However challenges to plastics recycling include collection and sorting logistics, a high volume to weight ratio, additives content (eg chlorine, stabilisers), contamination and mixed components (eg PVC in PET), multi-film layers, and achieving food grade quality from recycled plastics.
There is a need to redesign more products to incorporate more recyclable and hence less problematical plastics; the development of sustainable markets for recycled plastics, and improved technologies to extract energy from plastic wastes.

Emerging technologies include:

- Bio-plastics wherein the carbon is derived solely from renewable agricultural and forestry (eg food containers made from corn starch).
- Dissolvable and biodegradable plastics (eg such as the polymer polyvinyl PVOH used in soluble sutures, and in laundry liquid pouches).
- Fully recyclable zip lock pouches as an alternative to the current PE-based product.
- The manufacture of plastics from captured greenhouse gases.
- New waste processing technologies (eg optical sorting, cleaner chemical processing technologies, enzyme treatments, landfill gas capture, and energy production).

The benefits of re-use of plastics include:

- Reduced leakage of waste into the oceans.
- A reduction in greenhouse emissions.
- Reduced dependence on fossil fuels as feedstocks.
- Reduced dependence on other nations to take wastes.
- Reduced supply chain risks from companies by using recyclables.
- Job creation in the recycle industry.

In some cases, it is far too late – who is going to pick up and dispose of environmentally, the massive plastic rafts now congregating?

The very recent news that micro plastic has been recorded in a human stool by a UK laboratory should tell us everything we don't want to know.

The Pacific 'Garbage Patch' is thought to be two times the size of the continental US and is estimated to be 10 to 30 m deep. The mass of the plastic in the Great Pacific Garbage Patch is estimated to be at least 80,000 tonnes , which is 4-16 times more than previous calculations. This weight is also equivalent to that of 500 Jumbo jets.

After six explorations to the area, scientists estimate a total of 1.8 trillion plastic pieces are floating in the patch – equivalent to 250 pieces of debris for every human in the world.

NZ Institute of Hazardous Substances Management (Inc)

MEMBERSHIP APPLICATION FORM

1. Name: ……………………………………………………………………………………..

First Name *Surname*

2. **Employment**

Business/Employer's Name: ………………………………………………………….…….

Position and Contact Details:

Position Held: ………………………………………………………………………..

Qualifications: …………………………………………………………………….

Experience in HS:

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3. Preferred mailing address:

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Telephone Contacts (Bus.) (0) ………………………………………

(Res.) (0) ………………………………………

(Mob.) (02) ……………………………………...

(Facsimile) (0) ………………………………………

E-Mail: …………………………………………………………………………………

Website: ……………………………………………………………………………..

4. I have previously been a member of the Institute ❒Yes ❒No

If NO: I am applying to be a ❒Member ❒Associate member

5. **Return to**: P O Box 10-385, The Terrace, Wellington
Email: office@nzihsm.org.nz

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