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Public Comment Paper on SB-54 Implementation and PEIR: GO!PHA's Perspective

About GO!PHA

The Global Organization for Polyhydroxyalkanoates (GO!PHA) is a non-profit organization serving as a platform for knowledge sharing, education and advocacy efforts to facilitate integration of safe and innovative materials like PHA in policy development for a circular bioeconomy.

As a key stakeholder representing members and partners in California, the United States, and globally, GO!PHA strongly supports CalRecycle's efforts to drive the implementation of SB-54. We share CalRecycle's vision of creating a sustainable circular economy and are dedicated to contributing to the state's goals.

Holistic Environmental Assessment for True Circularity

A holistic approach for developing The Program Environmental Impact Report (PEIR) for SB-54 must explore various options and alternatives to assess possible negative impacts on existing systems, not only to reduce or avoid them but also to enable better practices that ensure long-term protection of California's natural resources, ecosystems, and public health. For this, a transition to closed loop systems must be implemented that includes utilization of biological, renewable resources for energy and material needs.

A bio-based economy enables the principles of the circular economy by utilizing renewable biological resources, such as plants, organic waste, and even CO2, as raw materials for producing energy, chemicals, and materials. In a circular bioeconomy, products are designed to be reused, recycled, and ultimately returned to the environment for regeneration without harming the environment. Today, materials derived from renewable sources in the biosphere can compete with conventional plastic applications, while also being compatible with current infrastructure - making them viable alternatives to fossil-based materials. Based on **Origin, Functionality, Impact and Safety,** the PEIR must strive to identify suitable substances and materials, support their development, and promote their use for targeted applications.

As highlighted in the Ellen MacArthur Foundation's New Plastics Economy Global Commitment report, decoupling from fossil resources and optimizing the use of bio-based materials at different stages of the product life cycle offers significant advantages over traditional and linear economic models reliant on fossil-based resources. CalRecycle must use this as a core principle in preparing parameters for assessing environmental impacts of plastic pollution, and in implementing mitigation processes.

Key Elements to consider for PEIR

The Program Environmental Impact Report (PEIR) is crucial to ensure California's efforts to tackle and prevent plastic pollution are effective, sustainable, and aligned with broader environmental and social goals. Below are the key environmental areas highlighted by CalRecycle with possible approaches to address them that GO!PHA believes could support a robust PEIR as industries and stakeholders adapt to the requirements of SB-54:

1. **Agricultural Resources**
    - **Potential Impact**: The implementation of SB-54 may require the conversion of agricultural land or natural habitats. It is essential that the PEIR ensures balanced land-use practices, considering the value of waste residues as resources. Holistic Life Cycle Assessments (LCAs) should be employed to consider environmental and social impacts in order to identify the best alternatives.
    - **Possible Approach**: An important aspect of circularity is reusing waste. The PEIR should explore ways to valorize what is traditionally considered waste, using it as source material for fuels and other applications.
    - **Best Practice Example**: Agricultural waste can be converted into high-value products, demonstrating the potential for waste valorization. An example is **almond hulls and shells** in California's Central Valley. Utilizing by-products from almond processing, this practice successfully converts into a range of products, including biochar (a soil amendment), renewable energy, and even components for industrially compostable plastics, Source.

      Another efficient circular manufacturing approach is practiced by PlantSwitch, which makes sustainable, high performance and affordable alternatives to plastics by utilizing agricultural by-products like sugarcane bagasse and cornstarch. Their plant-based applications are sourced and made in the USA and are designed to decompose industrially and naturally.

      Such practices exemplify the possibility of effective waste valorization by transforming renewable, plant-based residues into high-value, eco-friendly products, thereby supporting sustainable land-use practices and contributing to a circular economy. Source.

2. **Air Quality**
   - **Potential Impact**: Modifications in manufacturing processes to comply with SB-54 could affect industrial emissions, potentially increasing them. The PEIR should include measures to minimize air quality impacts, utilizing emission inventories and comparative studies to identify optimal alternatives. Additionally, it should consider innovative technologies for reducing air pollutants. As part of its broader efforts to reduce industrial environmental impact, the U.S. EPA supports Sustainable Manufacturing Practices, highlighting bio-based materials as eco-friendly alternatives to conventional petrochemical plastics. These materials are designed to emit fewer volatile organic compounds (VOCs) during production and use, helping to reduce air pollution and enhance air quality. By supporting innovative materials, California can become a model 'E3 Community' Source.
   - **Possible Approach**: As also highlighted by the new White House Executive Order and in Global Plastic Treaty discussions, emphasis needs to be placed on innovative practices supporting source reduction through sustainable product design and the use of alternative technologies and materials with fewer volatile organic compounds compared to conventional plastics. Another approach is using carbon capture techniques that can convert emissions like carbon dioxide, nitrogen, and methane into sustainable products further addressing long-term pollution. A review analysis on Sustainable materials alternative to petrochemical plastics pollution,2022 demonstrated that the sustainable production of bio-based materials results in lower air pollutant emissions compared to fossil fuel-based plastics.
   - **Best Practice Example**: **Newlight Technologies**, based in California, in partnership with **Dell Technologies**, developed AirCarbon, a safe material as an alternative for fossil based plastics made by capturing and converting greenhouse gasses like carbon dioxide and methane into a polymer. This process is carbon-negative, meaning it removes more carbon from the atmosphere than it emits, directly improving air quality by reducing harmful pollutants. Dell uses AirCarbon in its packaging, contributing to a circular economy and setting a precedent for sustainable manufacturing practices that enhance air quality while reducing industrial emissions. Source.

3. **Biological Resources**
    - **Potential Impact**: The transition to a circular bioeconomy will protect natural habitats by reducing the risk of harm to wildlife and ecosystems. The PEIR should ensure the use of technologies and methods that are less likely to accumulate in natural habitats or contribute to pollution in rivers, oceans, and forests. This includes promoting materials that are industrially compostable, supporting organic waste collection while minimizing environmental impact.
    - **Possible Approach**: The PEIR should prioritize the use of safe, non-toxic materials based on bioresources that are made with lower greenhouse gas emissions and are less likely to cause long-term harm to natural habitats. Research comparing the impacts of biobased substitutes versus traditional plastics in marine environments has highlighted significant benefits of using bio-based, innovative materials. Source.
    - **Best Practice Example:** California-based **Ecovative Design** exemplifies best practices in utilizing biological resources through its development of MycoComposite, a compostable material made from mycelium and agricultural waste. It replaces traditional plastics and foams in packaging, effectively breaking down in natural environments like soil and composting conditions. By using renewable resources such as mushrooms and agricultural by-products, Ecovative Design supports the circular bioeconomy and reduces the harmful long-term environmental impacts associated with conventional plastics. Source

4. **Geology and Soils**
    - **Potential Impact**: All soils are consistently exposed to a flood of micro- and nanoplastics particles from various routes, which are known to be harmful and persistent. A system change in waste management is necessary to build back better, as the continued use of conventional plastics, even with increased recycling rates, may have adverse effects on soil health. A move towards biocompatible alternatives can counteract soil deterioration by ensuring any leaked materials do not persist. However, even materials that can compost in the environment should still be promoted for industrial composting to maximize their environmental benefits and minimize unintended soil contamination.
    - **Possible Approach**: The PEIR should enable use of materials that improve soil health by adding organic matter and reducing the need for chemical fertilizers. Encouraging the use of organic mulches and composts that not only improve soil health but also help in reducing plastic waste in agricultural settings is another potential to explore. Support research and development of bioplastics that break

down more effectively in soil environments, ensuring that any residual material contributes positively to soil quality. Source.

- **Best Practice Example: BioBag**, with their production facility based in California, is a company that produces compostable bags and films made from materials like starches and plant-based polymers. BioBag's products are certified for compostability and are designed to decompose into organic matter, enriching the soil rather than contaminating it with microplastics. BioBag's clearly states BioBags are intended to decompose naturally in composting environments, breaking down at a rate comparable to other biodegradable materials. However, in most U.S. landfills, which are anaerobic (air-locked) and lack oxygen and essential microorganisms, BioBags, like other biodegradable materials, decompose very slowly or not at all. Therefore, correct composting guidelines should be followed to ensure proper decomposition with all compostable products. This approach supports soil health by contributing beneficial organic material and reducing reliance on chemical fertilizers. By integrating these compostable products into waste management and agricultural practices, BioBag helps address soil deterioration and promotes sustainable soil management practices. Source.

5. Land Use Planning:

- **Potential Impact:** Policy decisions must be made with a comprehensive understanding of their broader impacts on both land use and essential industries. Plant-based biopolymers used just 0.005% of global agricultural land in 2020, and even with significant growth, would only reach 0.088% by 2050 - leaving the majority of global biomass for food production and animal feed. However, even within the limited biomass for bio-based products, bioenergy, and biofuels, allocation is further strained by environmental challenges like biodiversity loss and water usage. This makes it crucial to support resources for clean energy and materials that support biomanufacturing and biotechnology growth via responsible land-use planning, efficient resources allocation and adoption of novel technologies and bioprocessing innovations. Source.
- **Possible Approach**: While many bio-based materials can also utilize agricultural biowaste as feedstock to further reduce demand of arable land, efficient and sustainable land use planning is crucial to balance competing demands. Enhancing recycling, advancing CO2 utilization, and promoting non-arable land for biomass can help meet sector needs while protecting environmental sustainability. A study

by nova Institute highlights that biomass utilization can seamlessly integrate with current practices while contributing to sustainability goals. Source

- **Best Practice Example**: **Loliware**, a California-based company, is a leading example of sustainable land use through its production of seaweed-based products. Loliware's seaweed-based materials do not compete with food production or require arable land, thereby avoiding the strain on agricultural resources. These materials are also designed to fit seamlessly into existing industrial composting systems. By being compatible with commercial composting facilities, Loliware's products contribute to environmental sustainability by ensuring they break down effectively in industrial composting environments, thus minimizing waste and reducing the environmental impact. Encouraging the use of such innovative technologies demonstrates the contribution of alternative materials towards environmental sustainability without exacerbating land-use challenges. Source.

6. **Greenhouse Gasses**
   - **Potential Impact:** The production and disposal of conventional plastics are significant contributors to greenhouse gas (GHG) emissions, primarily through the extraction and refining of fossil fuels and the incineration of plastic waste.
   - **Possible Approach:** The PEIR should emphasize the integration of carbon capture technologies and promote the use of low-carbon or carbon-negative materials to ensure that efforts to reduce plastic pollution also contribute to lowering overall GHG emissions.
   - **Best Practice Example**: Mango Materials, a California-based company, is pioneering the biological conversion of methane, ammonia, and aquatic nitrogen into naturally occurring material (PHA) that is capable of efficiently substituting fossil-based plastics in several applications. Funded by the U.S.National Science Foundation, this technology offers a closed-loop solution that reduces reliance on fossil-fuels for material needs, while also lowers greenhouse gas emissions. Source.

Conclusion

GO!PHA believes that the successful implementation of SB-54 hinges on a comprehensive and forward-looking PEIR that considers the full range of environmental impacts and opportunities presented by the transition to a circular bioeconomy. By incorporating innovative, naturally occurring materials and novel bioprocesses into a holistic approach to circularity, California can achieve its ambitious goals for plastic waste reduction, efficient resource management, and environmental protection. This transition not only offers substantial environmental benefits but also strengthens economic resilience and growth, making it a strategic priority for the state and its stakeholders.

We strongly support the development of a robust and forward-thinking PEIR as an essential component for the successful implementation of SB-54. A shift towards circular bioeconomy by committing to a clean energy economy presents a unique opportunity for California to lead by example in reducing plastic pollution and fostering environmental stewardship. Incorporating innovative materials, novel carbon capture technologies, and reducing reliance on fossil fuels can significantly enhance the state's efforts to achieve true circularity while contributing to U.S goals of decarbonizing the economy. GO!PHA is committed to supporting CalRecycle and other stakeholders in this critical transition, ensuring that California is at the forefront of source reduction and environmental protection.

Sincerely,

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GO!PHA
Global Organization for PHA

About GO!PHA

GO!PHA is a non-profit initiative to promote the use of biodegradable and compostable materials such as PolyHydroxyAlkanoate (PHA) biopolymers.

Renewable, biodegradable, and compostable materials provide a unique opportunity to reduce greenhouse gasses and environmental plastic pollution while establishing circularity in materials used by offering sustainable, functional, and natural materials that are renewable and offer diverse end-of-life options.

GO!PHA provides a knowledge-sharing platform, organizes experiences, and facilitates joint development initiatives with these natural, unique, and innovative materials. Join our cause and be a part of the movement towards a better and more sustainable future!

About PHA[1][2][3][4]

Polyhydroxyalkanoate (PHA) biopolymers are a class of natural materials that have existed for over 2 billion years. Like other natural materials such as wood, cellulose, proteins, and starch, PHA are produced in nature and this natural process (fermentation) is being used to produce them commercially.

Being a natural material, PHA are benign to living beings and are marine, freshwater and soil biodegradable. PHA are thermoplastic in nature having the attributes of 7 of the top selling fossil plastics in the world. PHA are being used in many applications to successfully replace fossil plastics [5]. PHA can be recycled for reuse, they are home and industrially compostable, and if they were to leak, they biodegrade in the marine environment, freshwater, and soil. Therefore, PHA does not create microplastics and in some countries they are even being used as animal feed.

GO!PHA is a UNEP-accredited non-profit, actively involved in Global Plastics Treaty development
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