PR.5
Identify the general opportunities and threats across the value chain

Requires dialogue

Having identified sustainability-related threats and opportunities, in this activity you will try to identify other sources of threat and opportunity that are not directly linked to sustainability issues.

INPUTS

- Choice of market to be investigated, from the activity *PR.1 Evaluate potential markets*.

OUTPUTS

- A structured list of sustainability challenges and opportunities for the value chain, used in the activity *PR.6 Develop a value chain vision*.

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To help you identify general opportunities and threats for the value chain you can use the PESTEL framework. PESTEL is often used by a company to scan their environment for emerging issues that may influence their success and strategy. Applying PESTEL involves searching the external environment of the company for significant issues or trends related to the following headings: political, economic, social, technological, environmental and legal.

HOW TO GO ABOUT IT

PESTEL instructions

1. Try to identify issues or trends that are or could have an impact on your target value chain using the PESTEL prompts table provided on the right.
2. Capture the issues and trends you have identified in the *PESTEL template* provided.
3. Capture details of the information source or an illustrative example of the trend, as this will be useful to provide credibility to your analysis when pitching to prospective companies.
4. For each issue that you have identified estimate:
   - **Impact –** What level of impact could the issue have on the value chain? Use a scale from 1-5 where: 1= Potential to create limited change within a limited part of the value chain, and 5 = Potential to revolutionise or destroy the entire value chain.
   - **Likelihood –** How likely is it that the issue will have an impact on the value chain? Use a scale where: 1= Very unlikely, 5= Very likely.

Template of PESTEL prompts

	Definition	Prompting questions
Political		
Economic		
Social		
Technological		
Environmental		
Legal		

PESTEL prompts

	Political	Economic	Social	Technological	Environmental	Legal
Definition	Includes issues such as policy context, including tax policy, labour law, environmental law, trade restrictions, tariffs, and political stability. Also relates to the governments influence in areas such as health, education, agriculture and the infrastructure of a nation.	Refers to the general economic situation in the value chain e.g. economic growth, interest rates, exchange rates and the inflation rate. Issues to do with market competition can also be included under the economic heading.	Relates to social trends, demographics and cultural aspects such as health consciousness, population growth rate, age distribution etc.	Includes issues such as R&D activity, automation, technology incentives and the rate of technological change within a value chain.	Can refer to issues such as the abundance of raw materials, eco-labelling practices, environmental policy and regulation, long-term risks from climate change (e.g. flooding, drought, sea-level rises).	All types of legislation that may impact the value chain such as discrimination law, consumer law, antitrust law, employment law, and health and safety law.
Prompting questions	• Is the government in your country implementing sustainable procurement principles? • Is it possible that a change of government could lead to a significant positive or negative shift in support for sustainability policies? • Has there been a recent disruption to value chain due to political events, industrial action, or failure of a key supplier?	• How is the economy in your country performing? • How is the economy performing in countries served by your target value chain (in cases where there are international markets)? • Are exchange rates having an impact on profitability within the value chain (if purchasing supplies or making sales in a different currency)? • How easy is it to get loans or attract investment? • How is the competitive landscape changing? Who is winning and why?	• How is the market changing in terms of demographics, attitudes etc.? • What is the 'industry and social buzz'? • What are people in the markets served by the value chain talking about and wanting? • What social issues are large companies reporting on? • What social sustainability issues are trending on social media platforms? • What social problems are people concerned about (poverty, employment conditions, HIV/AIDS, lack of equal opportunities etc.)?	• What new technology is emerging in this market? Or in related markets? • What global technology trends might impact this market? Examples of technology trends include: The 'Internet of Things', 'Big Data' analytics, 'Additive Manufacture', 'Mass customisation' and 'Artificial intelligence' (further information about these trends can be found in Section 1.10 References and resources)	• How is government policy supporting (or hindering) eco-innovation in your country? • What voluntary environmental standards are being implemented by leading companies in the industry?	• How is legislation supporting (or hindering) eco-innovation in your country? • Are any changes to employment or health and safety law expected?

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LEARNING CASE STUDY OF PESTEL PROMPTS

	Definition	Prompting questions
Political	Includes issues such as policy context, including tax policy, labour law, environmental law, trade restrictions, tariffs, and political stability. Also relates to the governments influence in areas such as health, education, agriculture and the infrastructure of a nation.	• Is the government in your country implementing sustainable procurement principles? • Is it possible that a change of government could lead to a significant positive or negative shift in support for sustainability policies? • Has there been a recent disruption to value chain due to political events, industrial action, or failure of a key supplier?
Economic	Refers to the general economic situation in the value chain e.g. economic growth, interest rates, exchange rates and the inflation rate. Issues to do with market competition can also be included under the economic heading.	• How is the economy in your country performing? • How is the economy performing in countries served by your target value chain (in cases where there are international markets)? • Are exchange rates having an impact on profitability within the value chain (if purchasing supplies or making sales in a different currency)? • How easy is it to get loans or attract investment? • How is the competitive landscape changing? Who is winning and why?
Social	Relates to social trends, demographics and cultural aspects such as health consciousness, population growth rate, age distribution etc.	• How is the market changing in terms of demographics, attitudes etc.? • What is the 'industry buzz'? • What are people in the markets served by the value chain talking about and wanting? • What is the 'social buzz'? • What social issues are large companies reporting on? • What social sustainability issues are trending on social media platforms? • What social problems are people concerned about (poverty, employment conditions, HIV/AIDS, lack of equal opportunities etc.)?

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	Definition	Prompting questions
Technological	Includes issues such as R&D activity, automation, technology incentives and the rate of technological change within a value chain.	• What new technology is emerging in this market? Or in related markets? • What global technology trends might impact this market? Examples of technology trends include: The 'Internet of Things', 'Big Data' analytics, 'Additive Manufacture', 'Mass customisation' and 'Artificial intelligence' (further information about these trends can be found in the Background Information section of this activity)
Environmental	Can refer to issues such as the abundance of raw materials, eco-labelling practices, environmental policy and regulation, long-term risks from climate change (e.g. flooding, drought, sea-level rises).	• How is government policy supporting (or hindering) eco-innovation in your country? • What voluntary environmental standards are being implemented by leading companies in the industry?
Legal	All types of legislation that may impact the value chain such as discrimination law, consumer law, antitrust law, employment law, and health and safety law.	• How is legislation supporting (or hindering) eco-innovation in your country? • Are any changes to employment or health and safety law expected?

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- **Time scale -** When will the issue will start to have an impact on the value chain? Indicate the expected timescale using the categories of: 'Within 6 months', 'Within 2 years', or 'More than 2 years' time'.

5. Decide which of the issues are 'significant' for the value chain by:
   - Calculating the significance score, where Significance = Impact x Probability.
   - Decide what score to use as the threshold for significance - 9 is suggested.
   - Review the table and highlight any issues that have a significance score greater than or equal to the significance threshold.
6. Finally, categorise the significant issues as either 'opportunities' (issues that might have a positive impact on the value chain) or 'threats' (issues that might have a negative impact on the value chain).

Template of PESTEL

	Description	Time	Impact	Likelihood	Significance
POLITICAL					
ECONOMIC					
SOCIAL					
TECHNOLOGICAL					
ENVIROMENTAL					
LEGAL					

PESTEL

Project _____ Date _____ Version _____

Heading	Description of issue/trend [Source or example]	Time scale (0-6/7-24/ 24+ months)	Impact (1= Very low, 5= Very high)	Likelihood (1=very unlikely, 5 = certain)	Significance (Impact x Likelihood)
POLITICAL					
ECONOMIC					
SOCIAL					
TECHNOLOGICAL					
ENVIRONMENTAL					
LEGAL					

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LEARNING CASE STUDY OF PESTEL

Heading	Description of issue/trend [Source or example]	Time scale (0-6/7-24/24+ months)	Impact (1= Very low, 5= Very high)	Likelihood (1=very unlikely, 5 = certain)	Significance (Impact x Likelihood)
POLITICAL	*EU Common Fisheries Policy imposing limits on catch within European waters. [EU:http://ec.europa.eu/fisheries/cfp/index_en.htm]*	*7-24 months*	*2*	*3*	*6*
ECONOMIC	*International fishing companies obtaining licenses to fish in the region (who do not process their catch in the region where it is caught). [Greenpeace: http://www.greenpeace.org.uk/oceans/tuna]*	*0-6 months*	*4*	*4*	*16*
SOCIAL	*Reports of slavery-like conditions on board tuna fishing vessels, with links to human trafficking. [Environmental Justice Foundation: http://ejfoundation.org/oceans/slaveryatsea]*	*0-6 months*	*3*	*3*	*9*
	Increasing consumer awareness of the unsustainable nature of current tuna fishing practices leading to consumer-led campaigns for improved sustainability practices within fishing and fish processing industry. [Fish Fight campaign: http://www.fishfight.net/]	*0-6 months*	*5*	*3*	*15*
TECHNOLOGICAL	*Increasing levels of automation helping to reduce production costs. [JBT FoodTech: https://www.youtube.com/watch?v=aIQRg0IWDSQ]*	*0-6 months*	*2*	*4*	*8*

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Heading	Description of issue/trend [Source or example]	Time scale (0-6/7-24/24+ months)	Impact (1= Very low, 5= Very high)	ikelihood (1=very unlikely, 5 = certain)	Significance (Impact x Likelihood)
ENVIRONMENTAL	*Concerns about overfishing and the impact of by catch on the marine eco-system associated with purse seine and long line fishing methods [FAO report: http://www.fao.org/fishery/fishtech/40/en]*	*0-6 months*	*5*	*4*	*20*
	Plastic waste in oceans is accumulating in fish and causing increases in toxicity of fish products. [Montana State University: http://serc.carleton.edu/NAGTWorkshops/health/case_studies/plastics.html]	*24+ months*	*2*	*3*	*8*
LEGAL	*Some countries considering news laws to protect rights and welfare workers in the fishing industry. [Slave free seas: http://slavefreeseas.org/workspace/downloads/itf-28-march-2014.pdf]*	*0-6 months*	*3*	*2*	*6*

N.B. 'Significant' issues (score of 9 or more) are highlighted in red

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TIPS & TRICKS

OVERLAP BETWEEN HEADINGS

There is inevitably some overlap between the headings used in the PESTEL analysis. For example, a new piece of environmental regulation could be included under the 'Political', 'Environmental' and 'Legal' headings. How you classify is not important as they are only prompts. The important thing is to ensure that all relevant issues have been captured.

ADD YOUR OWN

The prompting questions provided are not exhaustive so try to think of and answer some of your own questions.

OVERLAP WITH LCT

There will also be overlap between the PESTEL analysis and the results of the *Life Cycle Thinking template*, particularly within the 'environmental' and 'social' headings. Try to focus on the topics not already captured within the *Life Cycle Thinking template*.

POLICY GUIDANCE

The accompanying publication Mainstreaming Policies for Eco-Innovation' (UN Environment) is a useful source of information on types of policies that are being used to stimulate eco-innovation.

BACKGROUND INFORMATION

References and resources

Answering the questions outlined above will require a variety of sources of data, including qualitative and quantitative data from formal and informal sources. Below are some suggestions for where to look for the information you need, starting with sources of qualitative data.

- **Professional networking websites** – sites with discussion forums such as LinkedIn can offer some useful insights into the industry and social buzz and the types of threats that industry professionals are concerned about. With most sites offering membership at no cost, this can be a good place to start your research.
- **Government websites** – these should provide details of current and forthcoming policy and legislation. Try to keep up to date with developments in legislation as well as priority areas and themes for government funding. Where possible, try to develop contacts within relevant parts of the government so that you are the first to know of new developments that may be relevant for your target market.
- **Conferences and seminars** – if relevant events are happening in your area, it can be worth attending, both to hear about the types of threats and opportunities being discussed and to make new contacts. Attending a conference can represent a significant investment in terms of both time and cost, so try to research the event before committing to attend. For example, is the event organized by a reputable organization? Are there any companies that you would like to meet speaking or attending the event? Can you get more information about the delegates from the event organizer? How many people attending? What are their job titles? etc.

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- **Informal events** – is there somewhere where you can meet relevant people from your target market on an informal basis. For example, is there a 'Green Drinks' initiative in your area (http://www.greendrinks.org/)? If not, could you start one?
- **Trade publications** – many industries have trade publications that provide information on the latest developments in research and development as well as articles on significant threats for the industry.
- **Technology blogs and open innovation platforms** – Blogs focused on technology for developing and transitional economies such as the World Bank blog (http://blogs.worldbank.org/ - search for relevant tags such as 'Environment', 'Climate change', 'Social development' etc.) can provide useful information on technologies being applied in other markets around the world which might be transferrable to your country. Open innovation platforms, such as Yet2 (http://www.yet2.com/), are places where companies can provide details of technical problems they are trying to solve as well as novel technologies they have developed which are yet to find an application.
- **Corporate Social Responsibility (CSR) reports** – These reports provide information on the environmental and social sustainability performance of the company on a wide variety of issues, including gender equality. Many large companies now produce an annual CSR report in accordance with standards and schemes such as the Global Reporting Initiative (GRI). The GRI database (http://database.globalreporting.org/) contains over 15,000 reports and can be searched by sector. Part of the reporting process is to determine, using a systematic approach incorporating feedback from stakeholders, which sustainability issues are 'material' (important) for the company. These reports therefore represent many person-years' worth of research into the key sustainability threats and opportunities facing the industries they represent.
- **Technical patents** – the advent of online, searchable patent database has made it much easier to find relevant patents. Free to access databases, such as Espacenet (http://www.epo.org/searching/free/espacenet.html) which includes over 80 million patents and patent applications, can be used to find solutions to existing problems or to monitor the research and development activities of companies that you are interested in. If the patent office in your country does not have an online patent database, you can always look at patents from relevant companies in other markets to get an understanding of trends and developments that might be useful for companies in your target market.
- **National government departments for trade and industry, trade associations, SME associations and chambers of commerce** – each of these can be interesting sources of data, although the variety and quality of data will vary significantly from one organization to the next.
- **National departments for social rights** should be able to provide data on gender equality and women's empowerment within the country.
- **Academic and private research centres** – from the websites, email newsletters and publications of research centres you should be able establish if there are research groups working on issues that may be relevant to your eco-innovation services. If so, you may wish to build links with key personnel at those centres so that both sides have an understanding of the others interests and competencies, which will facilitate future collaborations.

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Quantitative data on markets and trends can be found in a variety of places. Sources include:

- International Trade Centre (ITC) – general data on international trade. Available from: http://www.intracen.org/
- World Trade Organization (WTO) – general data on international trade and market trends, including interactive trade maps. Available from: http://www.wto.org/english/res_e/statis_e/statis_e.htm
- UN Comtrade Database – general data on international trade Available from: http://comtrade.un.org/
- Centre for the Promotion of Imports from developing countries (CBI) – data on EU markets and trading with partners within the EU. Available from: http://www.cbi.eu/marketintel_platform
- Food and Agriculture Organization of the United Nations – data on global food prices and sustainability threats being faced by the agri-food sector. Available from: http://www.fao.org/
- COLEACP – information on sustainable horticulture. Available from: http://www.coleacp.org/en
- National government departments for trade and industry.
- Trade associations.
- Chambers of commerce and/or industry.
- Social rights associations.
- Women's rights associations.

Online patent databases:

Espacenet. Covers over 80 million patents and patent applications from around the world. Available from: http://www.epo.org/searching/free/espacenet.html

South African Online Patent Search. Free access to patents filed in South Africa. Available from: http://patentsearch.cipc.co.za

China Patent Information Center. Free access to patents filed in the People's Republic of China. Available from: http://search.cnpat.com.cn/CPRS2010/cnSimpleSearchEn.html

Global technology trends:

World Economic Forum (2015). The global information technology report 2015: ICTs for inclusive growth. Available from: http://www3.weforum.org/docs/WEF_Global_IT_Report_2015.pdf

McKinsey Global Institute (2013). Disruptive technologies: Advances that will transform life, business, and the global economy. Available from: http://www.mckinsey.com/business-functions/business-technology/our-insights/disruptive-technologies

Accenture (2016). People First: The Primacy of People in a Digital Age. Available from: https://www.accenture.com/us-en/insight-technology-trends-2016.aspx

United Nations Conference on Trade and Development (2015). Available from: http://unctad.org/en/pages/publications/Technology-Innovation-Report.aspx

Dickens, R., Kelly, M., Williams, J. R. (2013). What are the significant trends shaping technology relevant to manufacturing? Foresight, Government Office for Science. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/277164/ep6-technology-trends-relevant-to-manufacturing.pdf

→ Further information in the Agri-food, Chemicals and Metals Supplements

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TIPS & TRICKS

GATHER GENERAL INFORMATION ABOUT YOUR TARGET MARKET

Identifying markets and companies for eco-innovation requires substantial desk research and analysis. Important sources of information about the agri-food value chain can be found at:

- **International standards and guidelines** - Codex Alimentarius is a collection of international standards, guidelines, codes of practices and recommendations concerning: Food safety (HACCP, contaminants, pesticide residues, quality of water intended for food consumption, official control of foodstuffs, materials in contact with foodstuffs); Food hygiene (general rules, health rules concerning foodstuffs of animal origin); Food composition (additives, flavourings, processing aids, GMOs); Labelling (general labelling rules, quantitative ingredient declaration, nutrients declaration, lot identification, unit pricing, expiration date). Codex standards are based on the best available science assisted by independent international risk assessment bodies or ad-hoc consultations organized by FAO and WHO. http://www.codexalimentarius.org/.
- **FAO** – The Food and Agriculture Organisation within the UN (www.fao.org) has vast information about food and agricultural products. The website also hosts FAOSTAT - the most important source of data for global and national food prices, production, trade etc. Available from: http://faostat3.fao.org
- **Legislation** - Food safety, hygiene and composition are regulated on a national level, usually by a food and drug administration. Some regional and national legislation concerning food can be found at the websites of FAO and WHO. It is important to keep in mind that in the case of exports, the manufacturer must comply with the regulations of the importing country.
- **Industry driven initiatives** – Global Food Safety Initiative (GSFI, http://www.mygfsi.com/) can be used to find relevant information about food safety and guidance for SMEs on how to improve their manufacturing process. European Food SCP Roundtable (http://www.food-scp.eu/) offers information about sustainability issues in the agri-food value chain and provides guidance for companies in the whole food value chain on how to improve their sustainability performance.
- **Market specific industry initiatives** – such as Round Table for Sustainable Soy (RTRS, http://www.responsiblesoy.org/), Sustainable Spice Initiative (SSI, http://www.sustainablespicesinitiative.com/), Roundtable on Sustainable Palm Oil (http://www.rspo.org/) or The Sustainable Rice Platform (http://www.sustainablerice.org/) offer valuable information about specific markets and particular sustainability issues. Here you can find guidelines on sustainable practices and even market and trade data. Sustainability initiatives are co-operations between industry and NGOs and are active in many agri-food markets.

USE OPEN INNOVATION

Open innovation platforms such as allfoodexperts, (http://www.allfoodexperts.com/) and OpenUp (http://www.letsopenup.se) gathers expertise within the agri-food value chain that can provide external input on SMEs' needs and ideas. Additionally the European food technology network HighTech Europe (http://www.hightecheurope.com/) through its innovation portal (www.food-tech-portal.eu) provides useful information on latest technology, profiles of institutions and companies and services in food processing for those interested in open innovation.

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GATHER MARKET DATA

- **The Organisation for Economic Co-operation and Development (OECD)** – benchmarks, trade and market data and analysis of future trends (http://www.oecd.org/ and http://www.oecd-ilibrary.org/). Future trends in food production can be found in the Agricultural Outlook (http://www.oecd.org/site/oecd-faoagricultur-aloutlook/). The Agricultural Outlook, 2014-2023, is a collaboration between OECD and FAO. It brings together the commodity, policy and country expertise of both organisations and inputs from collaborating member countries to provide an annual assessment of prospects for the coming decade of national, regional and global agricultural commodity markets.
- **Food industry associations** – such as FoodDrinkEurope (http://www.fooddrinkeurope.eu/) provides, among others, data about market and consumer trends in the European market. Many countries have national food industry associations which can provide data and information relevant to the local context.
- **Food industry forums** - use the forums to find the latest news and the "industry buzz", as well as market trends and opportunities in your region. Some useful forum can be found at: http://www.foodprocessing.com/, http://www.food-packagingforum.org/

GATHER INFORMATION ABOUT ENVIRONMENTAL PERFORMANCE OF TYPICAL PRODUCTS

Environmental data and guidance:

- **Life Cycle Assessment data (LCA)** –There are various LCA databases available online. The European reference Life Cycle Database (ELCD, http://eplca.jrc.ec.europa.eu/ELCD3/index.xhtml) and LCA Digital Commons (http://www.lcacommons.gov/) can be accessed for free.
- **Best available technique REFerence documents (BREFs)** - each document gives information on a specific industrial sectors in the EU, on the techniques and processes used in the sector, current emission and consumption levels, techniques to consider in the determination of the best available techniques (BAT) and emerging techniques. Food, milk and drink processing is covered by BREFs as well as animal rearing. Available from: http://eippcb.jrc.ec.europa.eu/reference/

IDENTIFY VOLUNTARY INITIATIVES SUCH AS ECOLABELS RELEVANT FOR THE MARKET

Ecolabels help to inform consumers about the sustainability performance of a particular product and support purchasing decisions. Obtaining an ecolabel for a product can help companies to access certain new markets where such labels are a pre-requisite or are highly valued by customers. To receive an ecolabel a product has to comply with the guidelines of the label. There are over 200 different voluntary standards for food products, which can be confusing for both consumer and the industry. In order to compare different labels and get a general understanding of the requirements for certification, use: www.standardsmap.org. Standards Map is an online tool developed by the International Trade Centre for producers and manufacturers to easily compare the performance and requirements of different labels. Standards Map can be accessed by institutional users from developing economies free of charge.

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LEARNING CASE STUDY OF PESTEL

The following table shows a completed PESTEL analysis of the processed fruit and vegetables market, as well as the significance of each issue. Issues that are categorised as 'opportunities' are marked with red, while 'threats' are shown in grey.

Heading	Description of issue/trend	Time scale (0-6/7-24/24+ months)	Impact (1= Very low, 5= Very high)	Likelihood (1= very unlikely, 5= certain)	Significance (Impact x Likelihood)
Political	*The political situation is generally not stable which discourages foreign direct investments*	*24+*	*3*	*2*	*6*
	The taxation policy is often changing	*7-24 months*	*2*	*3*	*6*
	The fruits and vegetables processing market is supported by the government in the National Development Plan	*0-12 months*	*4*	*4*	*16*
Economic	*The availability and cost of fossil fuels is heavily affecting businesses as production, processing and distribution of foods are dependent on fossil fuels*	*24+ months*	*4*	*3*	*12*
	Supply of raw material is unstable and total yield loss is possible due to lack of pest control at supplier farms	*24+ months*	*5*	*2*	*10*
	The Government has given a high priority to the agriculture value chain, providing a number of fiscal reliefs and incentives to encourage commercialisation and value addition to agricultural produce	*0-6 months*	*2*	*5*	*10*
	Government initiative to provide a 50% tax concession specifically for the fruit and vegetable industry	*0-12 months*	*3*	*4*	*12*

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Heading	Description of issue/trend	Time scale (0-6/7-24/24+ months)	Impact (1= Very low, 5= Very high)	Likelihood (1= very unlikely, 5= certain)	Significance (Impact x Likelihood)
Social	*Expected increase in consumption of processed fruits and vegetable due to a growing middle class*	*24+ months*	*3*	*3*	*9*
	A growing urban and educated society is moving away from low quality snacks and carbonated soft drinks to healthier options.	*24+ months*	*3*	*2*	*6*
	High unemployment levels in local communities and rural migration	*24+ months*	*4*	*1*	*4*
Technological	*Lack of chilled transportation and cold storage is limiting the processing of fruits and vegetables*	*24+ months*	*2*	*4*	*8*
	Generally low technological awareness and automation	*0-24 months*	*2*	*3*	*6*
	Social media and enhanced IT systems are making it easier to identify trends in consumer buying behaviour and build brand awareness and loyalty, especially in the branded food and drink categories	*24+ months*	*2*	*4*	*8*
Environmental	*More frequent periods of heavy rain and extended droughts are negatively affecting the supply of fruits and vegetables*	*24+ months*	*5*	*1*	*5*
	Food and drink processing industry is the largest consumer of packaging material and creates large quantities of waste	*24+ months*	*3*	*4*	*12*
Legal	*Food and drink processing is highly regulated by the Food and Drug Administration*	24+ months	2	4	8
	Increasing consumer safety regulation	0-12 months	2	4	8
	Mandatory tracking and traceability requirement	0-6 months	3	2	6

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BACKGROUND INFORMATION

External factors affecting the agri-food value chain

Recently there has been an increased focus on sustainability challenges faced by the agri-food value chain. This has led to changes in how the companies, especially the multinationals, conduct business. This has important implications for SMEs as part of the global value chains. The increased focus on sustainability is largely due to heightened consumer awareness about the environmental and social impacts of food production, as well as recognition by companies of the economic advantages of tackling sustainability issues.

A number of external and internal factors affect the agri-food value chain (please see Table 3). A few are worth highlighting here for their implications for eco-innovation:

- Strong government support can be crucial in securing funding for eco-innovation activities and creating enabling policy environment. However, government involvement in terms of investment in research and development and incentivizing innovation and application of sustainable practices is inconsistent across countries and different markets.
- Legislation is creating stricter operational boundaries for food and drink processing businesses, e.g. through health, and safety standards and mandatory labelling. In many countries, many regulations exist to ensure safe and high quality food production. The situation can be further complicated by the rise of voluntary sustainability standards and labels. Lately, they have come to be seen as de facto regulation in globalized food value chains in view of heightened consumer concerns about food safety and multinational companies concern about the reputational risks. Being ahead of legislation can be challenging for SMEs but is an opportunity to stay operational and competitive.
- Margins in the agri-food value chain are generally low, which could be a limiting factor when applying the holistic approach of eco-innovation. Deviating from business-as-usual can be perceived as a significant risk in a low margin sector. However it is important to consider long-term impacts of continuing with business-as-usual. Eco-innovation utilises tools to identify the possible negative impacts of business-as-usual on a company and presents opportunities to mitigate these. For example, SMEs have the potential to enter high-end markets, or otherwise increase their margins, through new business strategies and business models.
- Consumer trends and preferences in food are shifting fast, particularly in rapidly urbanising areas. Consumer demand is placing greater emphasis on factors such as convenience, variety, nutrition, safety, presentation, and the origin of ingredients. Heightened awareness about safety and sustainability impacts and changing lifestyles are driving these demands. This requires a great deal of flexibility and foresight from food and drink processing companies to stay competitive (A.T. Kearney, 2012). This can be beneficial to SMEs that have a good understanding of their end consumers and are actively introducing changes and innovations to their operations in order to meet these demands. For example, in Asia, probiotic cultures for fortified dairy products is continuing to grow strongly with revenue projected to rise from US$310 million in 2011 to US$522.8 million in 2018. This is due to: increased research validating the health claims of improved intestinal health and immune system; the increasing affordability of probiotic products due to increasing purchasing power parity of consumers; and the growing focus on preventive medicine since the ageing population is expected to increase, particularly in Japan and Singapore (Frost and Sullivan, 2014).

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- Technology plays a key role in the agri-food value chain. Investments in technologies can facilitate scaling up of operations in volume and quality through production innovations. Also, new information and communication technologies (ICT) can facilitate the adoption of innovative business strategies and models. Precision agriculture techniques can permit a reduction in material inputs for primary production, with minimal disturbance to the natural resources. ICT allows for greater traceability and transparency in value chains and instant access to information for customers. Cold chain technologies can offer energy efficient solutions for transport and storage of food. However with eco-innovation, technology also implies utilizing techniques most relevant and fit to a SME context through a holistic approach, rather than simply importing new or more advanced systems.
- Intensive use of natural resources is a key trait of many agri-food value chains. Agricultural production, which supplies raw materials to the food and drink processing industry, is dependent on environmental conditions. Increasing frequent periods of droughts and heavy rainfall in many regions have decreased agricultural yields, straining the ability of food and drink processing companies to secure a stable supply of raw materials. Additionally many food and drink processing businesses are strictly seasonal with dependence on a particular crop. These environmental impacts accumulate across the entire value chain, providing multiple opportunities for eco-innovation.

Table 3. Trends directly influencing the agri-food value chain (Accenture, 2011)

Market trends	Sustainability challenges/opportunities to engage in eco-innovation
Growing environmental and social pressures	• Extreme weather conditions and temperature variations significantly impact productivity • Growing regulatory pressure from governments and civil society • Increase demand for transparency and traceability of food products
Increase in food security concerns	• Consumers increasingly demand safe and sustainable food products • Limited export in key producing regions • Increased land use for food production
Price volatility	• Price fluctuation of major food value chain inputs such as fertilizers, water, fossil fuel • Input costs are expected to rise in the near future • Raw material scarcity
Globalisation and growing role of developing countries in global trade	• Increasing need to improve value chain cooperation • Geopolitical risks • Globalized value chains
Changing consumption patterns and increasing demand from growing middle class	• Growing demand for food products • Increased demand for more sustainable products • Fast changing consumers preferences (increased variety of food, exotic food, healthy food, easy to handle food, time saving food, sustainably sourced food) • Aging population in developed countries • Significant changes in diets • Raw material and land scarcity
Technology and innovation	• Extensive use of water, energy and raw materials in the food value chain • Food waste and loss • Waste created from packaging • Increased legislative pressure on agri-food businesses • Increased public scrutiny and concerns about food safety

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Agri-food

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Accenture (2011), Achieving High Performance in the Agribusiness industry

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Chemicals

TIPS & TRICKS

IDENTIFY OPPORTUNITIES RELATED TO LEGAL TRENDS IN THE TARGET MARKETS

Some chemicals can severely damage our health and the environment. Hence their use in different applications and products is regulated at international, regional or national levels. Countries around the world have chemical regulations that require public disclosure on the safety of chemicals and require substitution through a safer alternative.

→ Refer to *'Background Information'* for examples of International Conventions, International Models, Regional Chemical Regulation and National Chemical Legislation.

By identifying these legal trends with the *PESTEL* template, you can stay on top of legislative developments in your domestic and export markets so that you can provide potential clients with a competitive advantage for being ahead of regulations. Innovative business models can include services helping customers meet regulatory obligations thereby offering an advantage over competitors.

Industry example 2: Legislation restricting substances in coating

Many countries have introduced or are planning to introduce legislations limiting the emissions of Volatile Organic Compounds (VOC) due to the use of organic solvents in paints (e.g. decorative and vehicle refinishing) in order to prevent adverse environmental effects of VOC emissions. As a result, many paint manufacturers are shifting from producing solvent-based paints to alternatives, such as water-based paints, high-solids paints, or powder coatings for a variety of applications. Legislation can also target specific hazardous chemicals of high concern. For example, the United States Consumer Product Safety Commission banned lead paint in certain consumer products and also placed a limit of the lead content in paints for manufacturers (0.009% as of 2009). This also led to the development of new products and technologies to replace the functionality that lead-containing compounds provided in various paint types.

IDENTIFY OPPORTUNITIES RELATED TO MARKET TRENDS IN THE TARGET MARKETS

Consumers are increasingly concerned about toxic chemicals used in products and are asking for products that are produced in a more sustainable manner, including incorporating non-hazardous chemicals, renewable resources, recycled materials, as well as energy and water-efficient technologies. Aim to identify sustainability-driven market trends in your region.

Industry example 3: Cosmetics

In the case of the cosmetics market, you could target the anti-ageing trend – the dominant trend in cosmetics – and offer (certified) natural resins or extracts, which can add value to anti-ageing products. Refer to the CBI for more market trends: https://www.cbi.eu/About%20CBI/sectors/Natural%20ingredients%20for%20cosmetics/1858/

Industry example 4: coatings

In the case of the paint resins market, a resins manufacturer bundled environmental compliance with improved productivity of the paint contractors in its end market to achieve a significant price premium.

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Chemicals

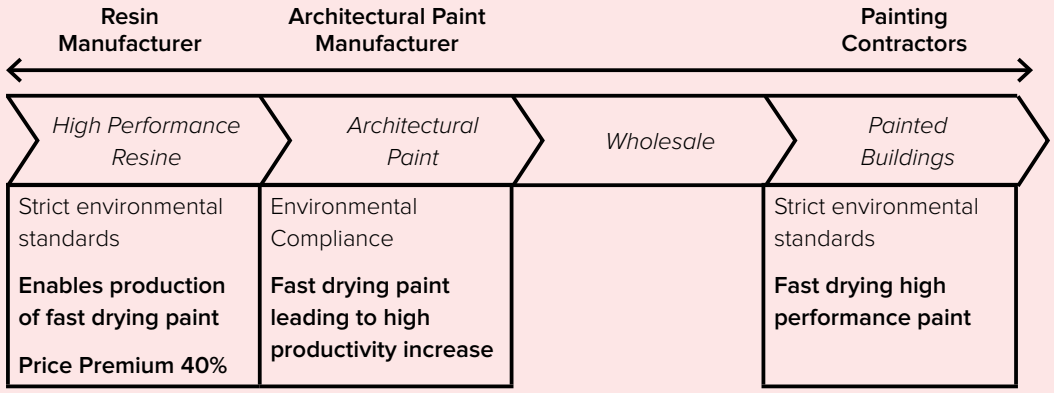
IDENTIFY THE VALUES AND NEEDS OF END MARKET CUSTOMERS

You may want to build a profound understanding of what makes a strong value proposition for companies in the chemical industry. Some factors that customers of the chemical industry typically value include product quality and performance, stability and reliability of supply, innovation that improves reliability/ quality and reduces costs – and of course price.

Since many chemical products are near the beginning of the manufacturing value chain, chemical manufacturers are often not in close contact with the end consumer. Therefore, it can be important for chemical manufacturers to understand what the end market customer values and needs when forming a value proposition in the chemical industry, as illustrated in the following example:

Industry example 5: Engaging the value chain to provide value to direct and end market customers, (Harvard Business Review, 2006)

A leading manufacturer of speciality resins used in the formulation of architectural coatings responded to changing regulations by developing a more expensive high performance resin that would enable its customers (paint manufacturers) to meet the new stricter environmental standards. Despite the same high functional performance level, customers did not migrate to the new resin due to the higher costs – the customers of the paint manufacturers (commercial painting contractors) did not want to absorb the higher price, preferring cheaper but less effective alternatives from competitors.



Only when the resin manufacturer engaged its customer's end market (the painting contractors), did it discover that it could improve the painting contractors' productivity significantly by manufacturing a resin that enabled the paint manufacturers to manufacture a fast-drying, environmentally compliant paint. By demonstrating and communicating the environmental and productivity improvements, the resin manufacturer was able to obtain a 40% price premium over the traditional high performance resin.

THINK IN TERMS OF VALUE NETWORKS TO IDENTIFY DRIVERS AND OPPORTUNITIES FOR ECO-INNOVATION

Thinking in terms of 'value networks' (interconnected value chains) can be an innovative way to see and identify opportunities within and across value chains. Background Information contains an overview of drivers for eco-innovation and some possible examples of solutions for different value networks (life sciences, mobility, housing and infrastructure, digital life, energy) in the chemical industry.

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Chemicals

LEARNING CASE STUDY

Value adding activities	Research & Development	Design	Production	Logistics	Marketing	Services	Packaging and labeling	Certification

Inputs	Textile manufacturing	Garment production	Distribution and sales
Raw materials: *Cotton, oil and natual gas, petrochemicals*	**Yarn and fabric wholesale**	**Garment:** *Hosiery, flat knit, cut & sew, accessories, packaging*	**Wholesale**
Natural fibre: *Cotton* **Synthetic fibre:** *Nylon Polyesters*	**Yarn:** *Cleaning, spinning*		**Direct customers**
Chemicals: *Bleaching chemicals, finishing chemicals, solvents, pigments, dyestuffs*	**Fabric:** *Sizing (e.g. polyviyl alcohols), dyeing, weaving*		**Retailers**
Packaging and labeiing	**Ink**		
	Finished textile: *Pretreatment, dyeing, printing, finishing*		

Textile markets
Corporate wear
School uniforms
Babies / toddlers clothes
Shirts for young adults
Promotional apparel

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Chemicals

The following list provides a summary of the sustainability challenges and opportunities resulting from the *PESTEL* template, that has not been included here.

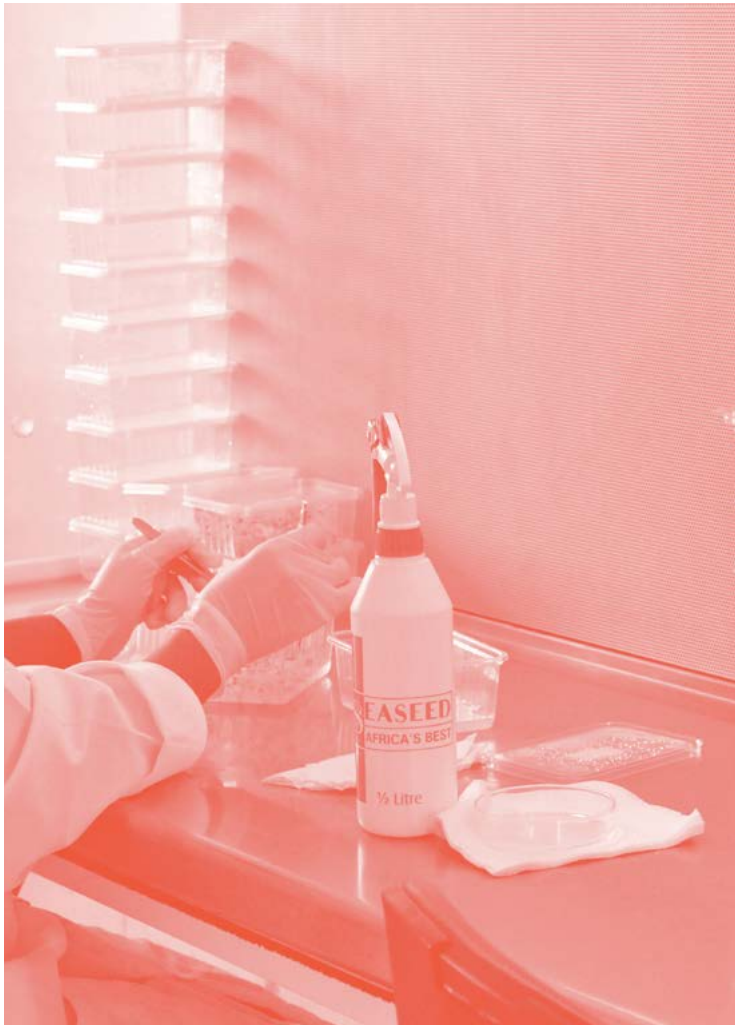
Challenges

International regulations and standards concerning hazardous chemicals become more stringent.

- Limited regional availability in high quality cotton and synthetic fibre feedstock and high prices
- Competition from low-cost regional and international companies putting pressure on the market share of domestic companies
- Women workplace participation in region is low since affordable day-care not available

Opportunities

- Consumers are becoming increasingly more aware of the risks associated with the chemicals used by the textile industry and want to ensure that the products they buy are sustainably sourced and manufactured responsibly
- Large international companies (Brands) are requiring suppliers in their supply chain to adopt best environmental practices and eliminate hazardous chemicals from the life cycle (e.g. ecolabels, social accountability, restricted chemicals list, etc.). The Zero Discharge of Hazardous Waste is one such value chain initiative



PR.5 Identify the general opportunities and threats across the value chain

Eco—i Chemicals

BACKGROUND INFORMATION

Legal trends

The following provides examples of regulations related to the chemicals sector and may be relevant for your value chain.

Relevant international conventions

There are a series of conventions that address specific chemical issues often indirectly creating favourable conditions for innovation, including the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (signed: 1989, entering into force: 1992), the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides (signed: 1998, entering into force: 2004), the Stockholm Convention on Persistent Organic Pollutants (signed: 2001, entering into force: 2004), the Montreal Protocol on Substances that Deplete the Ozone Layer (signed: 1987, entering into force: 1989), and the Minamata Convention on Mercury (signed: 2013, not yet entered into force).

Example international model

United Nations Globally Harmonised System of Classification and Labelling of Chemicals (GHS) (date of adoption and implementation vary between countries) is expected to facilitate global trade and the harmonised communication of hazard information of chemicals and to promote regulatory efficiency.

Relevant Regional Regulation: European Union

In the European Union the Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (EC Regulation 1907/2006) calls for the substitution of the most dangerous chemicals when suitable alternatives have been identified. It also pushes chemical companies and chemical industries to develop stronger relationships and better understanding how chemicals are used. The REACH complementing Regulation on Classification, Labelling and Packaging (CLP) (EC Regulation 1272/2008) aligns the European Union system of classification, labelling and packaging chemical substances and mixtures to the GHS.

Specific groups of chemicals in the EU specific groups of chemicals, such as biocides, pesticides, pharmaceuticals or cosmetics, are covered by their own legislation. These specific regulations aim to improve the function of the internal market in these products whilst ensuring a high level of environmental and human health protection since provisions on authorisation and placing on the market are prescribed.

The Waste Electrical and Electronic Equipment (WEEE) Directive (WEEE Directive 2012/19/EU) shifts the responsibility of the post-use phase of electronics to the producer and the Restriction of the use of Hazardous Substances (RoHS) Directive (RoHS recast Directive 2011/65/EU) restricts the use of certain substances in electrical and electronic equipment and requires substitution by safer alternatives.

By introducing the reduction scheme for emissions of Volatile Organic Compounds (EC Directive 2004/42/EC for VOCs in paints) EU companies using organic solvents in their processes were obliged to take measures to reduce emissions. This spur innovation related to substitution of solvents with less harmful substances, emissions reduction equipment, process optimisation, etc.

Ecodesign Directive (2009/125/EC, adoption 2009, stepwise implementation) aimed to encourage energy efficiency, is also

PR.5 Identify the general opportunities and threats across the value chain

enforcing other environmental considerations including materials use, waste issues and recyclability. These are specifically relevant for the cooling equipment of refrigerants (chemicals), therefore companies with innovative products that meet these standards will enhance access to EU export market, but also others with strict regulations. In addition, this is linked to the F-gas Regulation and the Montreal Protocol.

Example National chemicals related legislation: China

In June 2010, the Ministry of Environmental Protection in China adopted the Provisions on Environmental Regulations of New Chemical Substances, replacing a previous regulation from 2003. The 2010 regulations are similar to the EU's REACH and are known as "China REACH" (CBI,2015).

Table 10: Value networks with eco-innovation opportunities (Deloitte, 2011)

Value networks	**Trends and Drivers**		**Selected unmet needs where the global chemical industry can contribute**		

Life sciences:
End markets:
• Personal care
• Nutrition
• Pharmaceuticals
Supporting industry:
• Machinery
• Paper and packaging
• Agricultural products
	Demographics:
	• Aging population in developed countries
	Env./sustainability:
	• Eco-friendly packaging
	Human health/Regulation:
	• Increasing health consciousness and self-medication, self-monitoring
	• Shortage of nursing staff and doctors
	• Food safety packaging
	• Safer chemicals and processes
		Natural Resource scarcity:
		• Scarcity of food (competition with e.g., biofuel) and new patterns of consumption
		• Convenience food for developing countries
		• Private labels
		• Demographics
		• Increase of middle class causes shift towards eating meat
			Human health
			• Healthy cosmeceuticals or nutraceuticals
			• Agriculture:
			  • Genetically modified food crops with stress resistance and high yields for food and biofuel crops
			• Ingredients for geriatric medicine, chronic diseases, and oncology
			• Medical devices:
			  • Biometrics for everyday use
				• Telemedicine and remote monitoring systems
				• Nurse robots
				• Self healing materials
				• Medical devices carrying pharmaceuticals
				• Catalytic production of enantiomers
				Beauty and age
				• Anti-aging cosmeceuticals or nutracosmetics
					• Sustainable no waste products such as diapers, shampoo s or female products
					• Cosmetics for diverse ethnic groups or male grooming
					• Bio products with natural ingredients
					Food
					• Bio-based food production processes
					• Functional foods on nanoscale as next frontier

Value networks	Trends and Drivers		Selected unmet needs where the global chemical industry can contribute		
			• Nutraceuticals and nutracosmetics • Genetically engineered designer foods • Disease preventing ingredients (biomedical basis) • Dietary supplements	• Nutraceutical ingredients require suspension aids to preserve the original structure • Healthier, more nutritious, and allergy-free food • No waste processes	• Bio-security: Good sensing, storage, and shipping • Bottles/packaging lighter and stronger, with better thermal tolerance and less gas absorption • New service-based business models (Chemical Leasing)
Mobility <u>End markets:</u> • Automotive • Transportation <u>Supporting industry:</u> • Machinery • Solar • Apparel, textile, and leather • Battery • Electronics • Mining and metal	**New patterns of consumption/Demographics** • Senior-friendly transport • Demand for inexpensive cars • Demand for quality, functionality, and comfort in emerging middle class • Web-enabled cars that are connected with house, office, and personal devices • Efficient urban goods and people transport	**Env./Sustainability** • Demand for safe and green travel/transport • Reduced fuel and energy consumption • CO2 reduction in production and product in use • Recycling of cars and materials **Information sensing, collecting, and presenting technological convergence** • E-mobility	**Power train** • Electric • Hybrid and fuel-cell cars **Pay-per-use business models drive standardization** • Proactive coatings **Mass and urban transport:** • Systems and materials (lightweight, no reinforced) • Packages indicating content temperature history	**Cars** • Light-weight materials (plastic used as substitutes for metal under the hood and glazing) • Gluing instead of welding –Web connectivity • Energy generating vehicles/self-powered **Substitution of plastics by bioplastics tires** • High-performance tires/less abrasion	• Improve recyclability • Tire sensing **Batteries** • Compact batteries in the future • Fast rechargeable batteries and systems • Nano-materials with large surface-to-mass ratios to increase battery capacity

Value networks	Trends and Drivers		Selected unmet needs where the global chemical industry can contribute		
Housing and infrastructure End markets • Construction and infrastructure • Household appliances • Home furnishings Supporting industry • Machinery • Paper and packaging • Agricultural products	**New patterns of consumption:** • Demand for quality, functionality, and comfort in emerging middle class • Housing for developing countries • Easy life systems (smart houses; cleaning; etc.) **Urbanization:** • Need for infrastructure development	**Env./Sustainability:** • CO2 reduction in production and product in use • Recycling/biodegradability of materials • Energy efficient housing (passive house) **Demographics:** • Aging population in developed countries **Resource scarcity:** • Water	**Residential and commercial buildings:** • Proactive and protective coatings • Plastics with form memory • Wind energy self-powered buildings • Intelligent sensor networks • Smart energy management • Senior-friendly residential buildings/ solutions • Increasing use of wood instead of steel and cement	• Glazing • Significantly increased glazing • Substitute glass for bioplastics that are resistant and energy efficient **Infrastructure** • Nano-steel or nano-aluminium with higher durability • Systems to renovate canalization **Substitution of plastics by bioplastics** • Bio-based, biodegradable, and no volatiles materials	• Energy-efficient construction material (solar shingles, insulation, non-electric heating/cooling systems, etc.) **Gluing for adhesion** • CO2 neutral • Autarkic cities **Household** • Bio-based and biodegradable cleaners • Cleaners with proactive functionality • Household appliances that reduced water and energy consumption
Digital life End markets • Electronics • Medical devices • Commercial printing Supporting industry • Machinery • Solar • Battery • Mining and metal	**Convergence of technologies:** • All-in-one products • Information sensing, collecting, and presenting • Mobile “offices” **Reduced energy consumption and resource scarcity:** • Rare earths and water **Env./Sustainability** • CO2 reduction	• Recycling/ biodegradability of materials **New patterns of consumption** • Demand for quality, functionality, and comfort in developing middle class groups • Easy life systems (smart phones, smart houses, etc.)	**Bio-based, biodegradable, and energy efficient use of material:** • Substitution of plastics by bioplastics • Energy-efficient products and production processes **Web connectivity everywhere** • Intelligent sensor networks	• Home system management from a distance **Self-energized components** • Rare earth mineral substitutes • Rare earth recycling Proactive and protective coatings for electronics	**Battery long life and storage materials** • Electrical polymers Materials with enhanced optical, heat, etc. properties • Metals modifiers and metals material composites

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Chemicals

Value networks	Trends and Drivers		Selected unmet needs where the global chemical industry can contribute		
Energy End markets • Oil and gas • Solar/Wind/renewable • Energy/electric utilities Supporting industry • Machinery • Solar/Wind • Battery/Electronics	**Demographics** • Growth of world population **Increased per capita energy consumption** • Regulation/stimulus • Env./Sustainability • Desire for clean and safe energy • New renewables	**Resource scarcity** • Energy efficiency of renewables • Competition with food chain for land • Enough and clean water • Shale gas boom	**Alternative raw materials for chemical production** • Degradable drilling materials • No-waste processes • Energy use reduction materials such as insulation, electric transfer, weight, etc. • Bio refineries	**Long-term, cheap storage of electricity** • Solar • Bio-solar materials • Solar electric storage • Efficient and low cost cells • Batteries • Nanomaterials with large surface-to-mass ratios to increase battery capacity	• Batteries on organic basis without minerals and acids • Wind • Offshoring systems with more resistant materials and coatings to prevent corrosion and icing • Lightweight materials for larger wind blades

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PR.5 Identify the general opportunities and threats across the value chain

Eco—i Metals

TIPS & TRICKS

CONSIDER KEY DRIVERS FOR ECO-INNOVATION IN METALS VALUE CHAIN

Some key drivers that provide challenges and opportunities across the product life cycle in the metals sector include:

- Metal sector market considerations:
  - Economic effects e.g. price fluctuation and material availability
  - Restricted substances either regional or for export
  - Consumer trends e.g. retail sector, sustainable sourced products
  - Geo-political e.g. conflict minerals
- Specific regulations supporting eco-innovation, e.g. pollution control (VOCs, waste water), waste management, recycling, hazardous substances, resource efficiency (material, energy), OHS (occupational health and safety), industry standards (e.g. automotive), sustainable procurement, etc.
- Supply chain pressures, e.g. eco-labels, sustainability reporting, industry initiatives such as the Aluminum Stewardship Initiative (ASI) from Switzerland, led by several key industry players (among others AUDI, BMW, Jaguar Land Rover, Nespresso, Tetra Pak); the ASI seeks to mobilise a broad base of stakeholders to foster greater sustainability and transparency throughout the aluminium industry
- Particular partnership patterns e.g. eco-industrial parks, business clusters, etc. (see *Background information* of activity *PR.3 Building the right external partnerships*)

The following example from the metals sector illustrates how a compan introduced an eco-innovation approach in order to access new markets.

Industry example 1: Access to new markets

Adelca, Ecuador is a manufacturer of primarily fabricated structural steel products such as cold-drawn rebar, section profiles, annealed and galvanized wire, etc. that are commonly used in construction or the fabrication of finished products. The company changed their strategy to producing steel products made from 100% recycled steel with an emphasis on excellence in service as well as exporting specific product lines that fulfil international quality standards to neighbouring markets.

Since Adelca's demand for scrap metal to produce recycled steel products was higher than the locally available supply, the company modified its business model to focus on increasing the amount of scrap steel recovered from end users and invested in building up its network of recyclers. This included supporting the establishment of collection centres, donating metal cutting equipment, offering loans, and paying the best price for the scrap metal provided. Adelca improved the safe and effective management of scrap steel by investing in the training of the network of scrap steel suppliers in efficient echnologies and environmentally sound practices.

PR.5 Identify the general opportunities and threats across the value chain

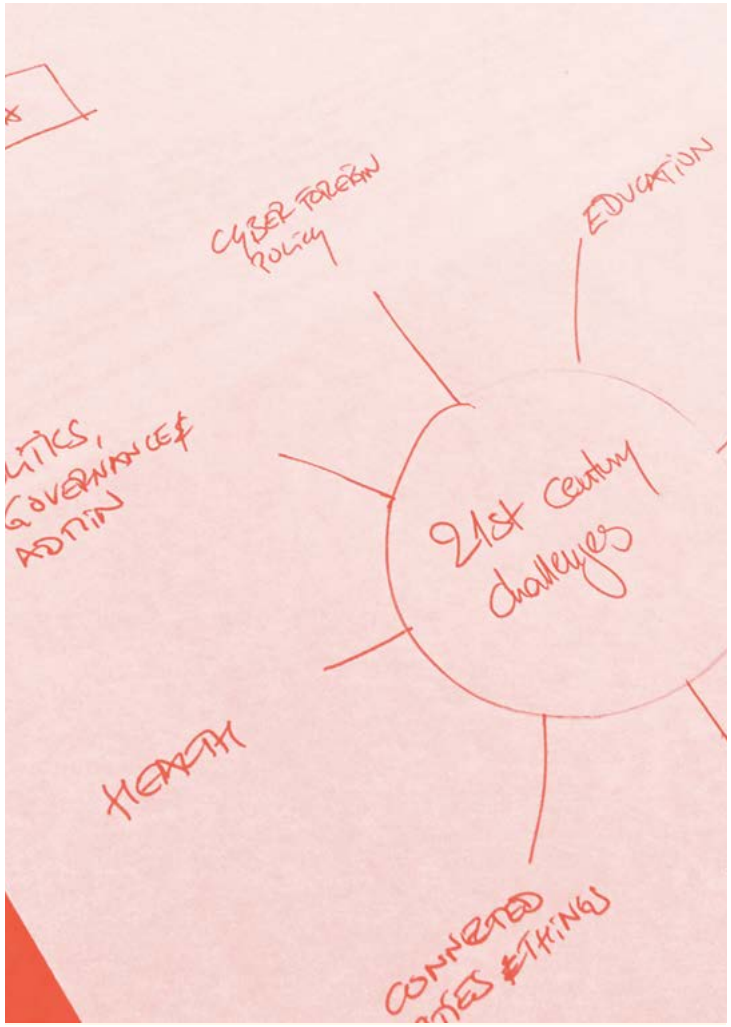
Another key component of Adelca's business model is the monitoring and integration of customers and suppliers needs through satisfaction surveys.

ECONOMIC BENEFITS

- Savings of US$ 12 million on the 20,000 tons of steel the company produces every month
- Recyclers network income exceeding US$ 1 million per month

ENVIRONMENTAL AND SOCIAL BENEFITS

- Savings result from each ton of recycled steel compared to virgin steel:
  - 1.5t iron ore and 0.5t coal saved
  - 40% less water, 75% less energy
  - 86% less air pollution
  - 76% less water pollution
- Integrated management systems: OHSAS 18001, ISO: 9001 and 14001 promoting continuous improvement in safety and environmental standards
- Company's recyclers network generates around 4,000 jobs (direct and indirect)



PR.5 Identify the general opportunities and threats across the value chain

Eco—i Metals

LEARNING CASE STUDY OF PESTEL

To convince your potential clients to engage in eco-innovation you should be well informed about the particular market and should be able to address the sustainability hotspots and more general sources of threats and opportunities faced in the market and the company. The *PESTEL* template can be used to analyse external environmental threads and opportunities for the company. The 'significant' threats and opportunities are those that score 9 or above and are highlighted in yellow.

→ Refer to *'Background Information'* for a list of selected legislations supporting eco- innovation in the metals sector.

Heading	Description of issue/trend	Source or example	Time scale (0-6/7-24/24+ months)	Impact (1= Very low, 5= Very high)	Likelihood (1= very unlikely, 5= certain)	Significance (Impact x Likelihood)
Political	*Geopolitical concerns related to mining operations.*	*British Geological Survey: The Future of the Global Minerals and Metals Sector: Issues and Challenges out to 2050*	*24+*	*Low 2*	*3*	*6*
Economic	*Price volatility of raw materials and basic materials.*	*McKinsey: Tracking global commodity market, 2013*	*0-6 months*	*High 4*	*4*	*16*
	Demand for more sustainable products.	*Sustainable Brands: Available at: http://www.sustainablebrands.com/news_and_views/behavior_change/50-global-consumers-willing-pay-more-socially-responsible-products*	*0-6 months*	*High 5*	*4*	*16*
Social	*Reports of unfair and difficult working conditions in the extraction industry.*	*ILO Newsletter. Available at: http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_187783/lang--en/index.htm*	*7-24 months*	*Medium 3*	*5*	*15*
	Health concerns related to chemicals used for the metal processing and paints.	*ILO. Available at: http://www.ilo.org/oshenc/part-xiii/metal-processing-and-metal-working-industry/metal-processing-and-metal-working/item/698-environmental-issues-in-metal-finishing-and-industrial-coatings*	*0-6 months*	*High 4*	*3*	*12*

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Metals

Heading	Description of issue/trend	Source or example	Time scale (0-6/7-24/24+ months)	Impact (1= Very low, 5= Very high)	Likelihood (1= very unlikely, 5= certain)	Significance (Impact x Likelihood)
Technological	*Increasing demand for high tech materials.*	*Available at: http://www.isi.fraunhofer.de/isi-en/service/presseinfos/2009/pri09-02.php*	*24+ months*	*Low 2*	*4*	*8*
Environmental	*Problems with high waste production and disposal of waste.*	*Waste Management World. Available at: http://www.waste-management-world.com/articles/print/volume-11/issue-2/features/waste-management-2030.html*	*0-6 months*	*High 5*	*4*	*20*
Legal	Some countries introduced the reduction scheme for emissions of VOC.	European Commission VOC directive. Available at: http://europa.eu/legislation_summaries/environment/air_pollution/l28029b_en.htm	7-24 months	Medium 3	5	15

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Metals

BACKGROUND INFORMATION

Table 5: Trends relevant for the metals sector [UN Environment, 2013; OECD Economic Outlook, 2014; pwc, 2014]

Market trends	**Sustainability challenges/opportunities to engage in eco-innovation**	**Emerging opportunities for eco-innovation**
Natural resources scarcity and climate change	• Raw material scarcity • Climate change impacts	• Resource efficiency • Recycling • Urban mining • New materials
Demographic change and urbanization	• Increasing demand for metals • Metal stocks in society	• Recycling • Urban mining • Energy efficiency
Globalisation	• Increasing need to improve value chain exchange • Geopolitical risks	• New business models • Urban mining
Patterns of mobility	• Increased movement of people and freight in terms of mode, distance, frequency, and time in transit • Increased movement of people and goods within and between urban regions, including work and pleasure travel	• Advanced technical solutions (i.e. information and communication technology) • Urban mining
Health and social risks from operations	• Metal toxicity (e.g. lead, tributyltin oxide (TBTO), mercury) • Bad working conditions • Use of chlorinated solvents in metal treatment process steps	• Toxic free metal products (e.g. lead free paint) • Alternative toxic free metal techniques • Substitution with safer chemicals or mechanical methods • Recycling • New business models • Urban mining

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Metals

Market trends	Sustainability challenges/opportunities to engage in eco-innovation	Emerging opportunities for eco-innovation
Regulation and public scrutiny	• Significant rise in regulation and standards for industry • Call for transparency on corporate sustainability performance	• New business models -incorporating life cycle thinking approach • Enhanced access to export markets
Consumption patterns	• Demand for sustainable products and services • Growing demand for technically advanced solutions • Increased pressure to meet strict sustainability criteria	• Sustainability being included into decision making processes • New funding opportunities • New markets for innovative solutions
Technology and innovation	• Optimization of recycling rate • More emphasis on R&D • Reducing the use of chemicals (e.g. metal treatment/ forming) • Equipment/product manufacturing	• Re-manufacturing • Reverse logistics • Green engineering • Materials with superior sustainability performance • Substituting the use of hazardous chemicals • Optimizing the use of chemicals • Product centric recycling

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Metals

Table 4 presents opportunities for businesses, including SMEs, to take advantage of different economic areas along the value chain (from extraction to manufacturing to end-of-life recovery). The areas are further categorized according to regional relevance (Asia, Latin America, Africa and Africa) and some indicative examples are provided. For all three regions, eco-innovation opportunities reside in new materials and new applications of materials, as well as manufacturing resource efficiency technologies and providing energy efficient solutions (often regionally tailored). For example, 'sustainable product design' is of high relevance in Asia, medium relevance in Latin America, and of low relevance in Africa.

Table 4: Overview of general opportunities for eco-innovation in the metals industry value chain for the Asian, African and Latin American regions [EIO, 2013] (colour coding below)

High relevance	
Medium relevance	
Low relevance	

Value chain	Area	Regional relevance			Business opportunity for SMEs
		Asia	Latin America	Africa	
	Cleaner extraction technologies				Exporting and/or adapting technology to the needs of emerging markets
	Restoration of mining sites				Consulting and re-designing mining and post-industrial sites (especially in re-adapting for urban use)
	Sustainable product design				Consulting services and specific assignments on designing products (also with a view to meet requirements of the current and future EU legislation)
	New materials and new applications of materials				Consulting on existing and developing new materials with better environmental performance
	Cleaner production systems				Consulting on, selling existing and/or adapting/ developing cleaner production systems
	Resource efficiency technologies (materials, water, biomass, land)				Consulting, providing services (e.g. ESCOs), developing and adapting technologies to the needs of local markets
	Energy efficiency technologies and solutions				
	Value chain integration				Consulting services from engineering companies
	Training workforce				Providing specific training and consulting services on the use of environmental technologies as well as on energy and material efficiency

PR.5 Identify the general opportunities and threats across the value chain

Eco—i Metals

Value chain	Area	Regional relevance			Business opportunity for SMEs
		Asia	Latin America	Africa	
	Transport logistics (freight)				Developing, selling and running transport logistics systems (both road, air and water)
	Alternative transport solutions				Promoting new solutions reducing energy intensity and emissions from transport (e.g. use of sails etc.)
	Product sharing schemes				Supporting emerging markets in developing business models supporting alternative product use schemes. The product sharing and leasing approaches are already spreading in many countries (e.g. cars, tools etc.). In emerging economies they could be solution allowing the user to benefit from the product without having to purchase it.
	Product leasing scheme				
	LCA / MIPS / GLUA / other environmental performance assessment methods				Developing measurement methods or perform product performance assessments. This could be linked with eco-labels and other labels and certifications.
	Waste treatment				Exporting and/or adapting technologies and organizational methods to the needs of emerging markets. It can also involve a genuine innovation collaboration taking into account specific needs of emerging regions.
	Recycling technologies				
	Electronic waste				
	Urban mining				
	Energy recovery				
	Designing green cities and green buildings				Promoting green city concept and specific building designs. The concepts can draw on European models and be co-developed with local architects and designers.
	Industrial ecology				Designing, implementing and consulting on industrial symbiosis.
	Sustainable mobility, including electric mobility				Designing, implementing and consulting on new mobility solutions
	Sustainable agriculture				Designing new farming concepts based e.g. on agro-ecology

PR.5 Identify the general opportunities and threats across the value chain

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Examples of selected legislations supporting eco-innovation in the metals industry

Relevant international conventions:

- A series of conventions exist, which address specific metal issues often indirectly creating favourable conditions for innovation, including the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989), the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides (1998), the Stockholm Convention on Persistent Organic Pollutants (2001) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1989).
- Another example is the Minamata Convention, which aims at curtailing the emissions of mercury on a global level. From 2020 onwards, particular mercury-containing products will be prohibited and health and safety measures have to be implemented. Industries in the contracting states are obliged to reduce their mercury emissions significantly.

Relevant regional regulations: European Union:

- Concerning waste electrical and electronic equipment (WEEE), the WEEE Directive and the RoHS Directive (restriction of the use of certain hazardous substances in electrical and electronic equipment) aim at establishing environmentally friendly disposal and recovery of electric and electronic disused devices. Producers of electric and electronic equipment are obliged to collect the products at their life cycle end and reuse, recycle or dispose them in an ecological manner. The RoHS Directive prohibits the use of certain heavy metals in the equipment in order to enhance the recyclability of WEEE.
- The regulation on the Registration, Evaluation, Authorisation and Restriction of Chemical substances (REACH) calls for the substitution of the most dangerous chemicals when suitable alternatives have been identified. This is specifically relevant for the metal treatment companies, which use chemicals in their processes. Therefore, REACH requests the industries to develop stronger relationships and better understanding on how chemicals are used.
- Greenhouse gas emissions are controlled by, amongst others, the EU Industrial Emissions Directive (IED) as well as the EU Emissions Trading System (EU ETS).
- The F-Gas Regulation on certain fluorinated GHGs implements the Kyoto Protocol. Every producer, importer and exporter of these gases is required to report to the commission and the national authority to enable them to control the implementation of the guidelines.
- Eco-design Directive, aimed to encourage energy efficiency, is also enforcing other environmental considerations including: materials use, waste issues and recyclability. These are specifically relevant for the cooling equipment also refrigerants (chemicals) therefore companies with innovative products that meet these standards will enhance access to EU export market, but also others with strict regulations. And in addition this is linked to the F-gas regulation and the Montreal Protocol.

PR.5 Identify the general opportunities and threats across the value chain

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Example of national legislation relevant for the metals sector: USA:

- Important to mention is the Dodd-Frank Wall Street Reform and Consumer Protection Act. Companies are obliged to disclose to the public the use of so-called conflict minerals, such as tin, wolframite, gold, and tantalum from the Democratic Republic of the Congo or its neighbouring countries. Similar regulations are being drafted in the European Union.
- Therefore, companies exporting to the US and EU have to be aware of these regulations, as a proof of the origin of these minerals is requested in case conflict materials are part of the products.

Example of national chemicals related legislation relevant for the metals sector: China

- In June of 2010, the Ministry of Environmental Protection in China adopted the Provisions on Environmental Regulations of New Chemical Substances, replacing a previous regulation from 2003. The 2010 regulations are similar to the EU's REACH and are known as "China REACH".

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