



## HOW TO MANAGE SUSTAINABLE SUPPLY CHAIN? THE ISSUE OF MATURITY

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**ABSTRACT. Background:** The issue of managing sustainability in supply chain seems to be more and more complex. There are many aspects that need to be taken into consideration when planning, implementing and monitoring environmental and social conditions of supply chains. Despite many works, already published, on the concept of sustainable development (SD) it seems that the issue of assessment and especially the issue of maturity in the light of the SD concept is still not developed enough.

**Methods:** The general aim of the paper is the analysis of the maturity issue in the context of sustainability. The main objective is to conceptualize the idea of maturity in sustainable supply chain. Beside the literature research the own proposition of theoretical model was described.

**Results:** The article describes the issue of maturity as an element of managing sustainable development in the supply chain. The author presented a theoretical model of the maturity. Moreover the author gave some recommendations how to manage the sustainability issues in supply chain in more mature approach and introduced some useful tools among which are: certification, code of conduct and code of ethics, audits, projects etc.

**Conclusions:** The issue of maturity seems to be very useful for proper understanding the idea of sustainable development in supply chain. The developed model can be used as self-assessment method to check at which level of implementation the idea of SD is analyzed in supply chain. Furthermore, the next phase of the planned research in form of practical verification of the model was advised as well as a research of identification of new factors and tools in analyzed area.

**Key words:** logistics, sustainable supply chain, sustainable supply chain management, maturity, sustainable supply chain maturity model.

### INTRODUCTION

Sustainable development (SD) is getting more and more popular concept. It is also treated as an important element of management of supply chains. The special term describing the issue of SD in supply chain is used. The concept of Sustainable Supply Chain is quite good described in literature [Carter, Rogers, 2008a, Carter and Rogers, 2008b, Beske, Seuring 2014, Svensson 2007, Holt, Ghobadian, 2009, Green et al., 2012, Zaabi et al. 2013, Cruz 2013, Azadeh et al. 2016]. It can be understood as "the management of material, information and capital flows as well

as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e. economic, environmental and social, into account which are derived from customer and stakeholder requirements" [Seuring, Müller 2008]. The cited definition put attention on two important elements: management of the network and three dimensions of sustainable development. It means that sustainability in supply chain can be only achieved in the situation in which, the noneconomic aspects are imprinted in the management system and visible at every stage from strategy to single operations.

But it is still challenging how to assess the scale of managing the supply chain in sustainable manner. It seems to be very crucial problem for corporations. They need to know the minimum guidelines and requirements in which their supply chain can be classified as sustainable and what kind of actions can be taken to improve it. The issue of maturity, to some extent, gives the answer for above critical questions.

On the level of single entity the mature organization can be characterized as "fully formed with typical features or getting the excellence [Dictrionary, website]". Maturity in supply chain is understood as "engagement in extensive collaboration across wide arc of supply chain partners in order to implement appropriate integrative practices." [Done 2011]. Combining the definition of sustainable supply chain and maturity in supply chain the author proposes a new definition. Maturity in sustainable supply chain can be defined as: level of engagement of the whole cooperative network and quality of management of social, environmental and economical dimensions of supply chain visible in its flow of material, information and capital. In other words it is the readiness to plan, implement and monitor sustainability issues in the whole life cycle of offered products. It shows the achievement of noneconomic goals and gaps to improve. The more mature approach to sustainable development the better flow of material and information and stronger cooperative bonds in the network. Proposed model is rather a framework that should be taken into consideration in organization that tries to manage the sustainable development. It is starting point of further improvements of the sustainable excellence in supply chain.

## **SUSTAINABLE SUPPLY CHAIN MATURITY MODEL**

Model consists of six drivers: knowledge, impact, social risk, environmental risk, cooperation and communication. Each category is assessed from 1 to 5 points (table 1). The proposed model can be used as a self-assessment tool.

Knowledge is a critical driver for the formation of transparent supply chain. Thanks

to clear processes and procedures it is easy to monitor the whole network, build trust among consumers and implement mechanisms of rapid alert system is something is going wrong. On the other side sharing knowledge allows to improve skills and abilities among business partners. It is very important especially among smaller companies that are not so sensitive and conscious about environmental and social issues. Transparency is a very important word for describing the current supply chain management. It is also strictly related to the knowledge sharing. Transparency is needed to avoid risk of losing reputation. It is also a very important factor of building open relations with stakeholders and involving them to sustainability actions [Turker et al. 2014].

Impact should be understood as the ability to make changes and have influence on key decisions. In another words changes for sustainability need to happen in the whole structure. The final effect is the sum of activities taken on level of single organization. If the company attempts to achieve certain goals and make a lasting transformation of the supply chain but suffers from the lack of support from individual links and the lack of enforcement of some solutions it may make plans difficult or even impossible to realize.

The problem of risk is a quite well-known category in supply chain [e.g. Małyszczek 2015, Jüttner 2005, Cucchiella, Gastaldi 2006, Tang 2006]. From the perspective of sustainability additional kinds of risk can be distinguished. The key risks are: risk related to human rights and work conditions, environmental risks including emissions, pollution, waste, dangerous substances and products etc.

The next issue is cooperation which can be understood as relations created between the whole network. It goes beyond formal agreements. The issue of communication is crucial for implementation of the idea of sustainability. It will be not possible to achieve common goals if partners will not know what are the expected results or future plans. The process of communication need to be extended also to customers. Special channels to inform and to making the feedback possible are needed to be designed.

Table 1. Areas of assessment of the maturity level  
Tabela 1. Obszary oceny poziomu dojrzałości

Poor (1 point)	Sufficient (2 points)	Good (3 points)	Very good (4 points)	Excellent (5 points)
<b>Knowledge</b>				
There is no knowledge about processes and relations in supply chain. Little or no knowledge about sub-suppliers and II/III row suppliers	Processes in life cycle are identified. The knowledge about suppliers and their partners about social and environmental aspects is limited	Suppliers in the whole supply chain are known. There is structured knowledge about processes and procedures in the whole supply chain	The whole life cycle is known. Processes are transparent. Social and environmental aspects are included in the maps of processes.	Supply chain is transparent. It is easy to identify the location of all links, each supplier and way of processing at each stage of life cycle. Knowledge is shared with customers.
<b>Impact</b>				
Limited impact on processes in supply chain	Impact on processes limited to the business relations with first row suppliers	Impact on the processes limited to the first row supplier including noneconomic aspects	Strong position in supply chain, impact on social and environmental aspects	Huge impact on a whole supply chain (including customers). Organization can decide about the policy and direction of further development
<b>Social risk</b>				
Not identified	Identified	Identified and managed (strategy)	Identified, managed and evaluated	Identified, managed, evaluated, independent assessment, certified
<b>Environmental risk</b>				
Not identified	Identified	Identified and managed (strategy)	Identified, managed and evaluated	Identified, managed, evaluated, independent assessment, certified
<b>Cooperation</b>				
Instable relations with suppliers	Transaction based cooperation	Clear business rules established. cooperation aims at longterm relationship built on trust	Regular meeting with suppliers, education and training, ethical principles	Common goals, social and environmental projects aim at development of noneconomic issues of supply chain, KPIs known and monitored
<b>Communication</b>				
Flow of information limited to the official agreements	Two sides communication limited to the official agreements	Structured system of communication, social dialog with suppliers	Good system of communication in the whole supply chain, whistleblowing policy, special channel to communicate about unethical cases	Two side flow of information, clients and users included in the process (feedback), social and environmental KPIs publicly available, different channels of communication available

Source: own elaboration

Table 2. Levels of maturity in sustainable supply chain management  
Tabela 2. Poziomy dojrzałości w zarządzaniu zrównoważonym łańcuchem dostaw

Level of maturity	Description
starting	There are organizations that do not manage their supply chains. They are only focus on short terms relations with suppliers. Non compliance actions (social/environmental) appear. There is no detailed knowledge about processes and relations in supply chain. The issue of sustainability is not taken into consideration as an important element of business strategy.
aware	organizations are aware of social and environmental aspects of their supply chains but they are characterized by reactive attitude. They identify potential risks but have no strategy how to manage them.
aspiring	organizations know about sustainability but it is not their priority. They manage social and environmental risks and include noneconomic aspect into supply chain management system.
sustainable business leaders	processes in supply chain are known, managed and controlled. There is a set of measures to assess the level of achievement of noneconomic KPIs. Organizations identify and manage their risks. The impact on processes is huge so organizations can influence the way suppliers behave. Sustainability is a main orientation of their development.
masters of sustainability	the most sustainable organizations in the industry. Sustainability is an element of their business models and is the main factor of supply chain management. They manage the sustainability issues but also communicate about it. They are independently assessed and certified. They educate their partners in supply chains. New projects and goals are set to improve KPIs.

Source: Own elaboration

The method of assessment could be included in the enterprise system of business self-improvement as a monitoring tool of supply chain. There are five different levels of maturity proposed. The more complex and comprehensive approach the higher level of maturity in supply chain. Table 2 presents levels of maturity and their short descriptions.

Starting level means that organization gather less than 6 points (4-6 answers have only 1 point). At the level of being aware: 4-6 answers have 2 points. To reach the name of "aspiring": 4-6 answers must have 3 points. To become sustainable business leaders: 4-6 answers need to have 4 points and masters of sustainability for 4-6 answers gather 5 points. In the situation that organization will gain 3 points from one category and 3 from the second it stays at lower level. There is also the possibility to gain very dispersed results between more than two levels. It means that the management system is not coherent and requires more careful approach in neglected areas.

## **HOW TO IMPROVE MATURITY LEVEL?**

Full formation of all aspect related to the sustainability is a long lasting process. Taking into consideration main aspect of sustainability like e.g. environmental protection, human rights, social inclusion, diversity management etc. business organizations need to be planned and join with the business model and strategy of the whole network. It seems to be very difficult when considering a single organization and it is much more complex among many entities with different cultures, norms, values or standards. On the other side there are some well known methods, tools and initiatives that support the process of change. It is worth to mentioning some of them:

- certification systems,
- audit systems,
- measurement system
- stakeholder management system including social dialog,
- ethical infrastructure,
- formal and informal education system.

There are different certifications systems that can be implemented successfully in supply chain like e.g. ISO 9001, ISO 14001, ISO 28000, supply chain risk management standards etc. There are also some systems that address specific types of industry like: automotive, food or textile. Even if they are not directly dedicated to the sustainability issues they improve the knowledge about processes and products. Next to the general standards there are available systems aimed at organizing the non-economic issues under the sustainability or social responsibility framework like: ISO 26000, AA1000 series, SA 8000 or Global Compact. Independent certification system is a kind of credibility for all interested parties. One can assume that verified systems work better what means they have more mature approach to business systems and can cope more efficient with challenges related to the environment and society. However it must be clearly stated that the implemented system is not just present but actively managed and perceived as a source of additional benefits for all partners.

Auditing scheme is very important in the process of monitoring and evaluating sustainability issues in supply chain. Usually there are some challenges to cope with such as: "managing information from the supply chain, motivating suppliers to pay for audits and complete questionnaires, the third is responding to audit results uncovering ethical violations in the supply chain, and the fourth is increasing awareness for a responsible supply chain among buyers." [Gonzales-Padron 2016]. However "the role and power of audits has grown significantly over the last decade, as audits have evolved from a tool that companies used to track internal organisational performance into a central mechanism of non-state efforts to measure and strengthen corporate accountability globally. Increasingly seen as a way to monitor and improve labour and environmental standards within production, reliance on the audit regime is deepening in the face of inadequate and declining state involvement in global corporate governance." [Lebaron, Lister 2015].

Performance measurement regarding sustainable supply chain is available in current scientific discussion [Taticchi et al. 2013, Schalteger, Burritt 2014, Ahi, Searcy 2015]. Some KPIs are developed including the most popular set of indicators from Global Reporting Initiative [GRI website] which can be also used to assess the current position of supply chains. The main challenge in this area is the implementation of coherent system of metrics that cover the whole life cycle of the products and will be unified for all links of supply chain. The more information about supply chains is gathered the easier process of setting the goals or making strategic decisions.

Stakeholder management can be identified as model of relationships with different groups of stakeholders by using different marketing and communicating methods and tools. There are many different groups and individuals that can influence our business operations like e.g. customers, workers, competitors, natural environment or suppliers. Stakeholders can in many cases worsen the image of organization or decrease selling of key products. They can cooperate and improve the competition advantage on the other hand. It is the reason why organizations decide to map and manage relations with stakeholders [Rudnicka 2012]. Suppliers are a specific group of stakeholders because of the huge impact on final product. They are directly responsible for the quality and safety of materials or subproducts. It is the reason why the stage of choosing and evaluation of suppliers very often is based on social and environmental criteria [Jasiulewicz-Kaczmarek et al. 2015]. In building and managing relations with suppliers the concept of social responsibility is often used [Urbaniak, 2015]. Ethical sphere is one of dimension needed to improve sustainability issues in supply chain. Different ethical tools exist in a mature organization (like for example: codes of conducts, manuals for suppliers, ethical lines, anticorruption policies, diversity management, ethical procedures and audits). If organization is making an effort to be more mature and have better sustainability results it should recognize the potential of minimum two things: codes of ethics and conduct and whistleblowing policy

as strategic elements. Code of conduct limits unethical behaviour in supply chain and underline the strategic points for all links to follow. Code of ethics "specify the minimum acceptable standards in corporate processes and procedures for them to be successfully implemented, employees need to be both aware of the standards and committed to achieving them." [Haugh, Talwar 2010]. Codes organize relationships in the supply chain. They note the core values and norms and are the basis for building the culture of accountability. Whistleblowing is understood as "disclosure by persons employed in the organization of information on actions taken by the other, may be unethical, illegal or unauthorized that may affect the functioning and effects of company [Hersch 2002]. Disclosure of information in planned and safe way is prerequisite for effective risk management, build trust and lower the number of unwanted events. Workers involvement is essential for making system live (by assuring the confidentiality of information, communication channels and protection of individual interests).

Suppliers will follow the rules if they will know what to do and how to do. Education in supply chain should be permanent element of business cooperation. Projects addressed to suppliers are of the much importance especially among smaller organizations. The mature approach is characterized by a willingness to share knowledge and learning in the best possible way to achieve common goals and multiply benefits.

Table 3 presents exemplary elements that can support management of maturity issues in sustainable supply chain related to different drivers of proposed model.

The optimum combination of available solutions gives the opportunity to improve and sustain the maturity of analysed network. The scale and diversity of methods depend on an industry, length of the chain, the complexity of products or level of maturity that has been already achieved.

Table 3. Exemplary elements that helps to improve the maturity in sustainable supply chain  
 Tabela 3. Przykładowe elementy pomocne doskonaleniu dojrzałości zrównoważonego łańcucha dostaw

Aspect	Element
Knowledge	<ul style="list-style-type: none"> <li>- clear criteria of choosing suppliers</li> <li>- short supply chain with small number of links (local production systems)</li> <li>- measuring systems</li> <li>- monitoring system</li> <li>- labor and safety and health standards evaluation</li> <li>- implemented CSR standards</li> <li>- feedback from employees</li> </ul>
Impact	<ul style="list-style-type: none"> <li>- certification systems</li> <li>- social and environmental projects (with real impact on stakeholders)</li> <li>- sustainability criteria during choosing and evaluation suppliers</li> <li>- code of conduct and code of ethics</li> <li>- implemented CSR standards</li> <li>- common social and environmental goals</li> </ul>
Risk management	<ul style="list-style-type: none"> <li>- workshops</li> <li>- trainings</li> <li>- implemented certification system</li> <li>- monitoring system</li> <li>- ethical infrastructure</li> </ul>
Communication	<ul style="list-style-type: none"> <li>- social dialog</li> <li>- internal newsletters, newspapers and leaflets</li> <li>- whistleblowing policy</li> <li>- common social and environmental goals</li> <li>- different channels to different groups of stakeholders</li> </ul>
Cooperation	<ul style="list-style-type: none"> <li>- common strategy</li> <li>- noneconomic reporting</li> <li>- stakeholder management</li> <li>- common social and environmental goals</li> <li>- shared responsibility</li> <li>- common benefits strategy (win-win approach)</li> <li>- knowledge shared and distributed in whole supply chains</li> </ul>

Source: Own elaboration

## CONCLUSIONS

The level of maturity testifies preparing the organization to take new challenges. For the sustainable supply chain maturity means a willingness to integrate social and environmental management system into business operations, plans and strategies. The more components of sustainable development is defined the greater level of maturity is achieved. Maturity is the ability to take advantage of the ready-made solutions and tools that help manage the sustainability. A more efficient and conscious creation of business reality is the result of their implementation. The company based on sustainable business approach must meet many, sometimes contradictory, goals and objectives. The key point is to treat in the same way economic, environmental and social values what in the case of such a complex structure as the supply chain can be very difficult. Hence, it is good to fit a set of tools to the actual needs of the supply chain. The

maturity issue is - like sustainability - the process that can be achieved via several steps. The proposed checkpoints in described model show what and to what extent should be improved in supply chain to make it more sustainable.

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## JAK ZARZĄDZAĆ ZRÓWNOWAŻONYM ŁAŃCUCHEM DOSTAW. ISTOTA DOJRZAŁOŚCI

**STRESZCZENIE. Wstęp:** Problematyka zarządzania zrównoważonym rozwojem w łańcuchu dostaw wydaje się być coraz bardziej złożona. Istnieje wiele aspektów, które muszą być brane pod uwagę przy planowaniu, realizacji i monitorowaniu warunków środowiskowych i społecznych w łańcuchach dostaw. Mimo dużego dorobku naukowego dotyczącego problematyki zrównoważonego rozwoju (ZR) w łańcuchu dostaw kwestia oceny, a zwłaszcza poziomu dojrzałości nie jest jeszcze wystarczająco rozwinięta.

**Metody:** Głównym celem artykułu jest analiza kwestii dojrzałości w kontekście zrównoważonego rozwoju. Obok przeglądu literatury autorka prezentuje własną propozycję modelu teoretycznego.

**Wyniki:** W artykule nakreślono istotę dojrzałości w kontekście zarządzania zrównoważonym łańcuchem dostaw. Autorka przedstawiła teoretyczny model dojrzałości. Dodatkowym elementem są rekomendacje uzupełnione o narzędzia, które można wykorzystać w praktyce jak np.: system certyfikacji, kodeksy postępowania, kodeksy etyczne, audyty czy projekty.

**Wnioski:** Włączenie kwestii dojrzałości do problematyki zarządzania zrównoważonym łańcuchem dostaw wydaje się bardzo potrzebne. Dzięki niej organizacjom łatwiej jest rozumieć istotę zrównoważonego rozwoju. Zaproponowany model użyty jako metoda samooceny dodatkowo pozwala sprawdzić, na jakim poziomie wdrożenia jest obecnie analizowany przez organizację łańcuchu dostaw. W kolejnej fazie planowanych badań zweryfikowany zostanie model teoretyczny. Dodatkowym kierunkiem badań opisywanej problematyki jest identyfikacja kluczowych czynników sukcesu i ich weryfikacja na podstawie badań empirycznych.

**Słowa kluczowe:** logistyka, zrównoważony łańcuch dostaw, zarządzanie zrównoważonym łańcuchem dostaw, dojrzałość, zrównoważony model dojrzałości łańcucha dostaw.



## WIE DIE AUSGEWOGENE LIEFERKETTE ZU MANAGEN IST. DAS WESEN VON LIEFERKETTEN-REIFE

**ZUSAMMENFASSUNG. Einleitung:** Die Problemstellung des Managements der ausgewogenen Entwicklung innerhalb einer Lieferkette scheint immer komplexer zu sein. Es gibt viele Aspekte, die bei Planung, Abwicklung und Verfolgung von sozialen und Umfeld-Gegebenheiten in Lieferketten beachtet werden müssen. Trotz der weitgehenden wissenschaftlichen Erforschung der Problemstellung der ausgewogenen Entwicklung innerhalb von Lieferketten ist die Beurteilungsfrage, insbesondere die des Reife-Niveaus einer Lieferkette nicht ausreichend etabliert.

**Methoden:** Das Hauptziel der Arbeit ist es, die Frage der Lieferketten-Reife im Zusammenhang mit der ausgewogenen Entwicklung zu analysieren. Neben der Literatur-Übersicht präsentiert die Autorin ihren eigenen Entwurf eines theoretischen Modells.

**Ergebnisse:** Im Artikel wurde das Wesen der Lieferketten-Reife im Kontext des Managements der ausgewogenen Lieferkette projiziert. Die Autorin stellte ein theoretisches Reife-Modell dar. Ein zusätzliches Element ergeben die um entsprechende Tools ergänzten Empfehlungen, wie z.B. Zertifizierungssystem, ethische Kodexe, Verhaltensnormen und -ordnungen, Audits und Projekte, die man praktisch umsetzen kann.

**Fazit:** Die Anbindung der Lieferketten-Reife an die Problemstellung des Managements der ausgewogenen Lieferkette vermag sehr brauchbar zu sein. Dadurch fällt den dafür interessierten Wirtschaftseinrichtungen leichter, das Wesen der ausgewogenen Entwicklung zu nachvollziehen. Das vorgeschlagene und als Mittel für die Selbsteinschätzung angewendete Modell lässt ferner den Stand der Einführung einer Neuorganisation innerhalb der Lieferkette ermitteln. In der nachfolgenden Phase der geplanten Forschungen wird das theoretische Modell verifiziert werden. Eine zusätzliche Ausrichtung bei der Erforschung der betreffenden Fragestellungen stellen die Ermittlung von schlüsselhaften Erfolgsfaktoren und deren Verifizierung anhand von empirischen Forschungen dar.

**Codewörter:** Logistik, ausgewogene Lieferkette, Management der ausgewogenen Lieferkette, Lieferketten-Reife, ausgewogenes Modell der Lieferketten-Reife

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