Journal of Hydrology: Regional Studies 11 (2017) 266–277

Contents lists available at ScienceDirect

Journal of Hydrology: Regional Studies

journal homepage: www.elsevier.com/locate/ejrh

Enhancing water security in a rapidly developing shale gas region

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ARTICLE INFO

Article history:
Received 24 June 2015
Received in revised form 2 September 2015
Accepted 6 September 2015
Available online 6 October 2015

Keywords:
Water security
Resilience
Shale gas development
Vulnerability
Wastewater
Northeast British Columbia

ABSTRACT

Study region: This study is based in the rapidly developing shale gas region of Northeast British Columbia, Canada.
Study focus: Water security is central to decision-making within a water–energy nexus. In areas where energy resources, such as shale gas, are undergoing rapid development, water security and the associated risks to water quality and quantity are of paramount concern. However, in many regions there is a lack of understanding and data on the hydrologic system, particularly its vulnerability to hazards. The data and knowledge gap poses challenges for effective regulation of the shale gas activities and management of water resources. This paper describes initiatives that are addressing concerns surrounding water security in Northeast British Columbia.
New hydrological insights for the region: Initiatives and tools enhancing water security in the region include strategic partnerships and stakeholder collaborations, policy and regulation development, and data collection and distribution efforts. The contributions and limitations of each of these are discussed. A vulnerability mapping framework is presented which addresses data gaps and provides a tool for decision-making surrounding risk to water quality from various hazards. An example vulnerability assessment was conducted for wastewater transport along pipeline and trucking corridors.

1. Introduction

The northeast region of the province of British Columbia (BC), Canada is estimated to hold significant unconventional natural gas reserves. Four major plays are identified in the region, with the Montney being the largest and most developed (Fig. 1). This play represents substantial commercial and economic significance to the region (Financial Post, 2014). Shale gas development in Northeast BC has occurred very rapidly following technological advancements in hydraulic fracturing and directional drilling that make unconventional sources economically feasible (Vidic et al., 2013). In the past 16 years, there has been an 82% increase in the number of shale gas development applications (BC Oil and Gas Commission (BCOGC), 1999, 2014a). In addition, estimates of the remaining reserves are increasing with marketable gas volumes projected to increase by 14% between 2015 and 2016 alone (BC Oil and Gas Commission (BCOGC), 2014a). However, the rapid development of shale gas in this region has not been matched by advances in the scientific understanding of the environmental impacts (Canadian Council of Academies, 2014). This lack of understanding poses challenges for effective regulation of shale gas

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http://dx.doi.org/10.1016/j.ejrh.2015.09.005

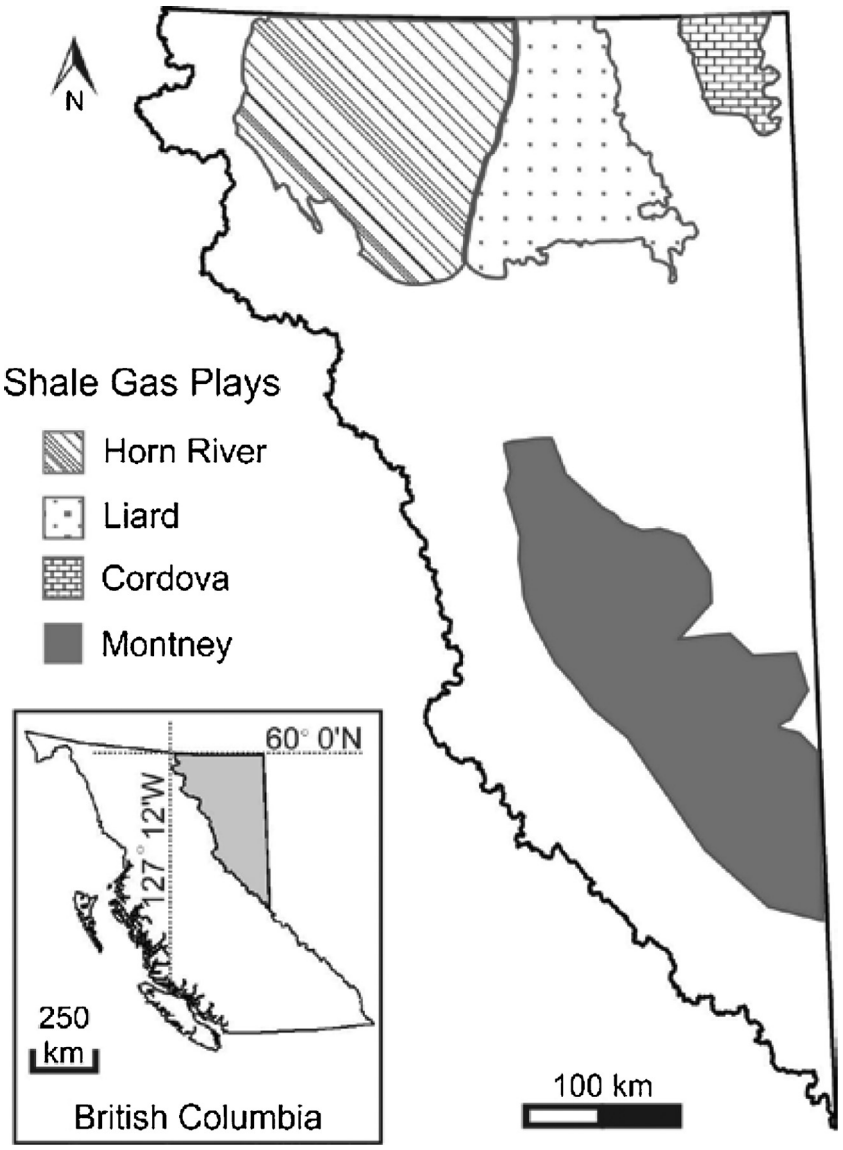

Fig. 1. Northeast BC shale gas plays.

activities alongside effective management of the environment, specifically water. Meanwhile, shale gas development is poised to continue to grow significantly in the coming years. The province of BC is committed to building a liquefied natural gas (LNG) industry under its LNG Strategy (Province of British Columbia, 2012, 2013). BC also has a vision of becoming a global leader in secure and sustainable natural gas investment, development and export, and has set a goal of having three LNG facilities in operation by 2020 (Province of British Columbia, 2015a). With such potential growth, it has become evident that an approach to policy based on historical experience with conventional oil and gas development may not be adequate for dealing with the emerging context (Goss et al., 2015).

The growth of shale gas activities in Northeast BC creates a water–energy nexus that is characterised by growing conflict surrounding water use and protection (Canadian Council of Academies, 2014). Shale gas development has the potential to significantly impact water security in the region, both through water consumption and potential contamination (Vengosh et al., 2014). Although the region is sparsely populated, water security for both human and environmental needs may be impacted. The water resources of Northeast BC require sound management in order to protect water quality and quantity in relation to the risks to water security presented by shale gas development. These risks may be minimised by strategies that build resilience (Simpson et al., 2014), such as enhancing monitoring systems, collecting baseline environmental data, strengthening enforcement capacities, preparing evidence-based regulatory requirements, and improving public engagement and transparency (Hays et al., 2015).